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Crucifix Frog (*Notaden bennettii*) from Old Angledool, New South Wales (photo: G. Shea). See article on the etymology of Australian frog names on p. 18.

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AN OBSERVATION OF INVERTED POSTURING BY A GRAVID COASTAL TAIPAN, *OXYURANUS SCUTELLATUS* (ELAPIDAE)

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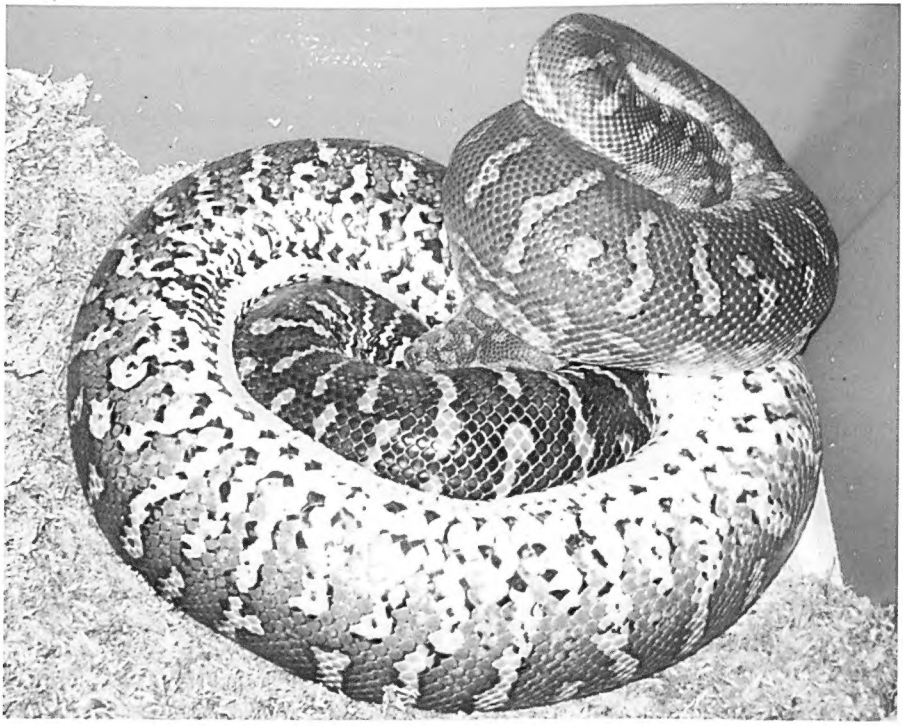
ABSTRACT

Inverted posturing by gestating (gravid) females of python species has been widely reported. To date however there has been no documented case of this behaviour for other families. Described here is a case of inverted posturing in a gravid female Coastal Taipan, *Oxyuranus scutellatus*, an elapid snake. Possible implications of inverted posturing for gestational thermoregulation and other interpretations of this behaviour are suggested and discussed.

INTRODUCTION

Inverted posturing by gravid females has been observed in all Australian python species and subspecies: Children's Python *Antaresia childreni* (Sonnemann, 2001), Pygmy Python *Antaresia perthensis* (Oliver, pers. comm.), Spotted Python *Antaresia maculosa* (pers. obs.), Stimson's Python *Antaresia stimsoni* (Sonnemann, 2003), Black-headed Python *Aspidites melanocephalus* (Naylor, 1995), Woma Python *Aspidites ramsayi* (Krauss, 1994), Water Python *Liasis mackloti* (Hay,

Figure 1. A gravid female Centralian Carpet Python (*Morelia bredli*) displaying the characteristic exaggerated inverted posturing (Photo: L. Allen).



1998 as *Liasis fuscus*), Olive Python *Liasis olivaceus* (Barker & Barker, 1994), Rough-scaled Python *Morelia carinata* (Weigel, 2007), Scrub Python *Morelia kinghorni* (Barnett, 2007), Oenpelli Python *Morelia oenpelliensis* (Krauss, 1992), Centralian Carpet Python *Morelia bredli* (pers. obs.; Figure 1), Green Python *Morelia viridis* (Oliver, pers. comm.), Diamond Python *Morelia spilota spilota* (Stone, pers. comm.), South Western Carpet Python *Morelia spilota imbricata* (Bush, pers. comm.), North Western Carpet Python *Morelia spilota variegata* (Kortlang, 1991), Inland Carpet Python *Morelia spilota metcalfei* (Heard, 2002), Coastal Carpet Python *Morelia spilota mcdowelli* (Charles *et al.*, 1985) and Jungle Carpet Python *Morelia spilota cheynei* (pers. obs.). Some documented cases are summarized and discussed in Greer (1997) where the behaviour is referred to as 'the ventral side up or out' posture (Greer, 1997: 35). The benefit of inverted posturing is uncertain, and there is some discussion as to why the gravid female resorts to this.

Inverted posturing involves the female rolling to the side to direct the flanks and ventral surface upward (Figure 1). It has been hypothesized the behaviour may be used for one of two reasons: in order to relieve increasing pressure on the egg mass by the female's thick dorsal musculature and vertebral column (Shea in Greer, 1997: 35; Torr, 2000), or as a thermophilic behaviour, exposing the gestating eggs to higher temperatures (Ross, 1981), warming the developing eggs more effectively than if radiant heat from the sun was being conducted through the more heavily muscled dorsal surface (Greer, 1997: 35). An inverted observation was also made in a captive gravid *Morelia spilota variegata* which was maintained with no external heat source (Kortlang, 1991) and gravid female *Antaresia* spp. have also been observed to assume this inverted posture when supplied with floor heating via heat mats (pers. obs.). Both observations suggest that the former hypothesis is more likely than the second in explaining the reason for the inverted posture.

This paper extends the previous observations on pythons to an elapid species, the Coastal Taipan, *Oxyuranus scutellatus* (Peters, 1867), Australia's largest elapid and, like pythons, oviparous.

MATERIALS AND METHODS

During September and October 2009 a gravid female Coastal Taipan *O. scutellatus* was maintained in a wooden enclosure measuring 60 x 90 cm. The enclosure was fitted with a 75 W reflector globe towards one end and a wooden hide box was supplied at the opposite end of the enclosure to the globe. Ventilation occurred by wire mesh, taking up approximately 2/3 of the hinged enclosure top (Figure 2). The globe was on constantly but controlled by a Habistat® dimming thermostat. This provided a gradient with a constant basking temperature directly beneath the globe of 32-34°C and a constant 24-25°C within the hide box. The female was fed liberally throughout gestation on weaned rats, accepting food until late in gestation.

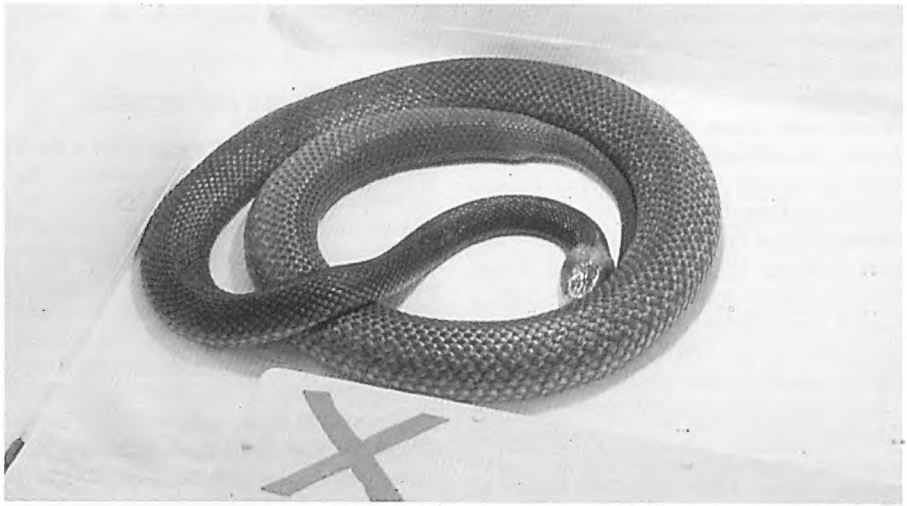
OBSERVATIONS

Throughout gestation the female shuttled between the hide box and a basking position directly beneath the globe during the day (night-time movements were not noted). Casual observations suggested alternation between basking and retreating to the hide box for blocks of two hours each.

On occasion the female would be observed in a partially inverted posture and on one occasion in an almost completely inverted position, as observed in pythons, but always in association with the basking site. Upon approach, the snake would rapidly right itself into a defensive position and if closer approach was made, the refuge of the hide box was sought swiftly.

Because of the nervous disposition of the subject, a photographic record was difficult to obtain. However a partially inverted posture was recorded (Figure 2).

Figure 2. A gravid female Coastal Taipan *O. scutellatus* displaying a partially inverted basking posture during gestation (Photo: L. Allen).



DISCUSSION

This appears to be the first recorded documentation of inverted posturing by a gravid Australian elapid.

Formerly at Venom Supplies Pty Ltd, normal incandescent globes or heat mats were used and never before this instance had reflector globes been employed in these enclosures. Many elapid species have been bred on numerous occasions at the facility, and in particular, large numbers of Coastal Taipans have been bred (Allen, in prep.; Mirtschin, 1988, 1989) but never before has inverted posturing of a gravid female been observed, despite plenty of opportunity for such observations. This suggests that the behaviour was brought about by the use of the reflector globe, which simulates radiant solar energy. The observation of a gravid taipan adopting the inverted posture in response to a particular radiant heat source suggests that, at least in this species, the inversion may facilitate heat transfer to the developing eggs rather than being related to female comfort.

It is curious that elapids are not observed to engage in this action more often, when it has been so frequently observed in pythons. The action may be common in captivity because of the combination of a low substrate temperature with an intense radiating overhead heat, a combination less likely to occur in nature.

I am unaware of any published or unpublished observations of inverted posturing by wild gravid pythons, and it may not be a normal part of gestational thermoregulation *in situ*. When observed in captive pythons, it is not always in association with basking behaviour and will also take place in the cooler part of enclosures, supporting the comfort hypothesis for this group of snakes (Shea, in Greer, 1997: 35; Torr, 2000).

Further work on thermoregulation and posture of gravid pythons and elapids in natural situations is required to resolve the function of the posture, now that it has been recorded in a second lineage of snakes with different activity patterns and thermal requirements.

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OBSERVATIONS OF A NESTING SITE FOR THE GREEN TREE SNAKE (*DENDRELAPHIS PUNCTULATA*) IN SOUTH EAST QUEENSLAND.

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ABSTRACT

A Green Tree Snake (*Dendrelaphis punctulata*) nesting site was exposed on February 7 2013 on a property in Southeast Queensland. The tree cavity contained 50 eggs and two egg casings within a crevice inside a narrow-leafed ironbark tree felled by the property owner. Two damaged eggs and 48 undamaged eggs were collected and incubated. All hatching occured over the following 5 days. This is the first record of a natural *D. punctulata* nesting site, and the number of eggs present at this site suggests communal nesting in this species. This tree nesting behaviour casts doubt on soil humidity being the driver of seasonality in reproduction within this species. We argue that seasonality of *D. punctulata* nesting is more likely a consequence of appropriate humidity and temperature within nest cavities, particularly in its' southern range.

INTRODUCTION AND OBSERVATIONS

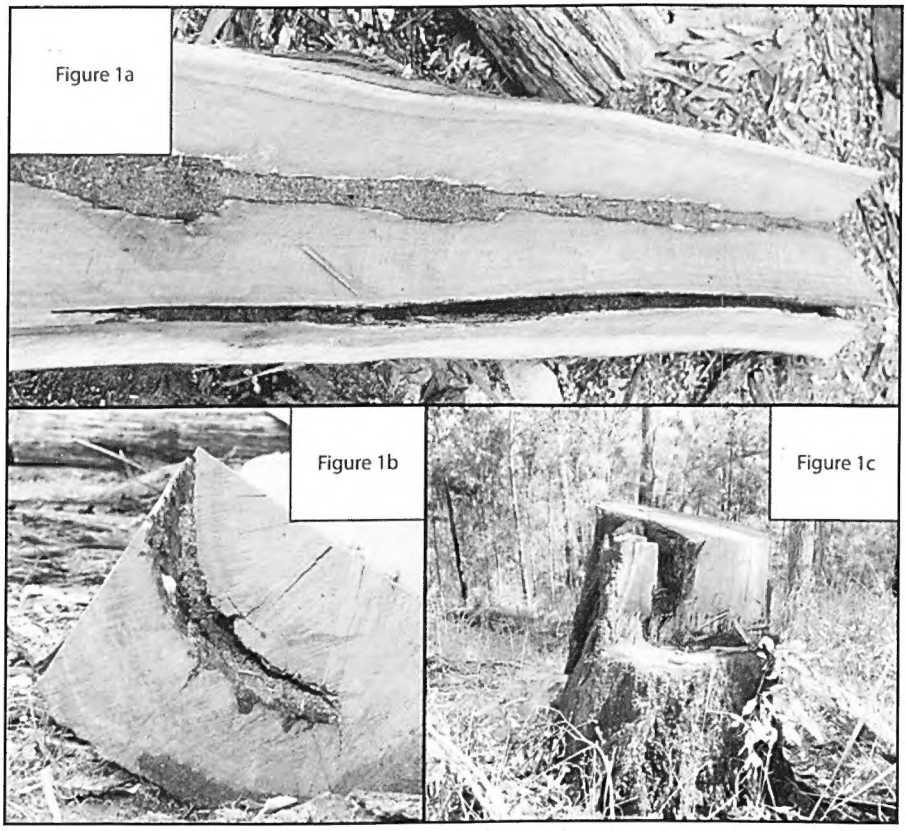
On February 7 2013, a large cluster of unidentified snake eggs was discovered inside a cavity in a tree trunk that had been felled in Kilcoy, southeast Queensland. The following day the eggs and deceased individuals from two damaged eggs were collected, examined, and identified as Green Tree Snakes (*Dendrelaphis punctulata*), a slender, diurnal, largely arboreal, non-venomous colubrid snake (Shine, 1991).

The Kilcoy area of southeast Queensland is the western-most part of the Sunshine Coast hinterlands. The region is subtropical and adjacent to the Conondale Range region of the Australian Great Dividing Range. Land use of this region is predominantly grazing pasture and consists of relatively open subdivisions, grazing and cropping properties with significant patches of dry sclerophyll forest. The egg cache was discovered on the western edge of the property near Bellthorpe State Forest, inside the tree hollow of a narrow-leafed ironbark tree (*Eucalyptus crebra*). The hollow entrance was at the fire damaged base of the tree. Local microhabitat was predominantly dry sclerophyll forest on a rocky substrate with significant grass, shrub and log cover, with nearby seasonal creeks.

The cavity containing the eggs was 180 cm long, 5 cm wide and 20 cm at its deepest point (Figure 1). This was a pre-existing naturally formed tree cavity and was described as "packed full of eggs" (Michael Hills, pers. comm.). Later inspection of the stump revealed a natural split forming a narrow passage into the tree cavity which widened from 25 x 55 mm to 48 x 50 mm. The size of the hollow entrance precluded access to nest predators such as monitor lizards and birds. Two eggs and the embryos within were damaged in the sawing process. These individuals were near hatching, but severely injured and euthanized prior to our collection. Identification was by physical inspection including mid-body scale count. Two empty, desiccated egg casings were also found at the cut site, both elongate ovals and approximately 40 mm by 20 mm with slits similar to those from a hatching event, but more brittle and damaged than any recently hatched egg casing (JT, pers. obs.). Eggs were collected in a plastic container with paper for cushioning and support, and reoriented to their original vertical position.

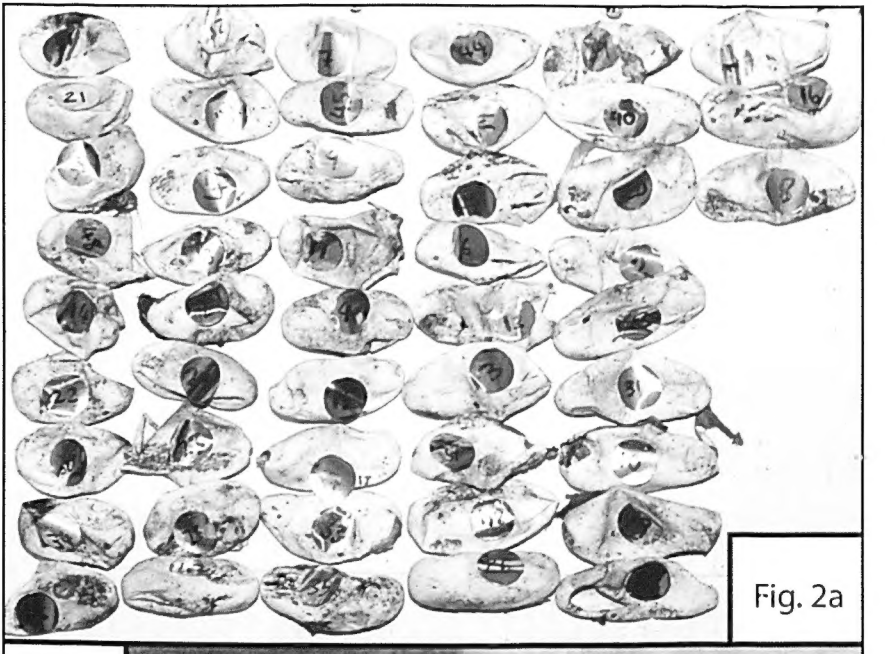
Eggs were incubated at 31°C with 87% humidity. There was high variation in the size of the eggs within the nest. Lengths ranged from 35 mm to 54 mm (mean = 43.6 mm) and diameters from 16 mm to 23 mm (mean = 19.3) (Figure 2a). *D. punctulata* has a

Figure 1. Location of egg cache. Figure 1a and 1b respectively show a lateral section and transverse section of the tree trunk with crevice in which eggs were found. Figure 1c shows the site where the tree was standing.



strongly seasonal Spring/Summer reproductive period (Fearn & Trembath, 2010). As evident from the individuals found in damaged eggs and the discovery of this clutch towards the end of the reproductive period (i.e. late summer), the eggs were well developed. Hatching occurred over the next 5 days, with all 48 individuals surviving the initial trauma of tree felling, exposure and reorientation. Hatchling snout-vent length ranged from 232 mm to 296 mm (mean = 262.0 mm), while total length from 312 mm to 401 mm (mean = 356.1 mm) (Figure 2b; see Table 1 for full record of egg and hatchling sizes). One individual had severely malformed eyes, the left exhibiting severe edema and appearing opaque (Figure 3). Clinical diagnosis through the University of Queensland School of Veterinary Science was of bilateral exophthalmos with corneal ulceration, and was hypothesized as a congenital defect. This individual was euthanized under anaesthesia with pentobarbital. Post-mortem pathology revealed retrobulbar haemorrhage, unilateral retinal detachment, unilateral prolapse of lens and retina, and ulcerative keratosis. All other individuals were later released at the site of collection.

Figure 2. Eggs and hatchlings. Figure 2a, egg collection post hatching, organised by length in columns from top to bottom, left to right. Figure 2b, a cluster of live hatchlings, aggregated under egg carton in the terrarium.



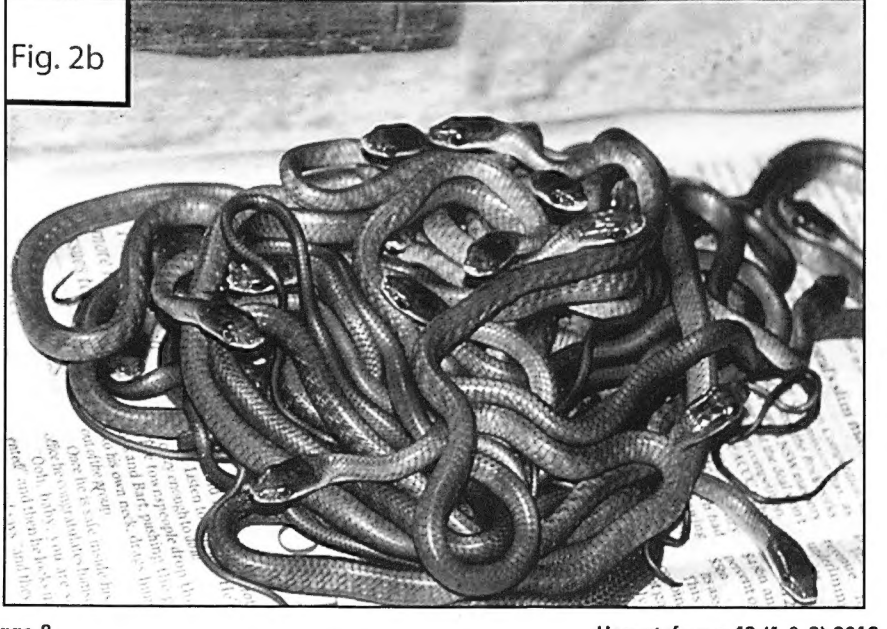
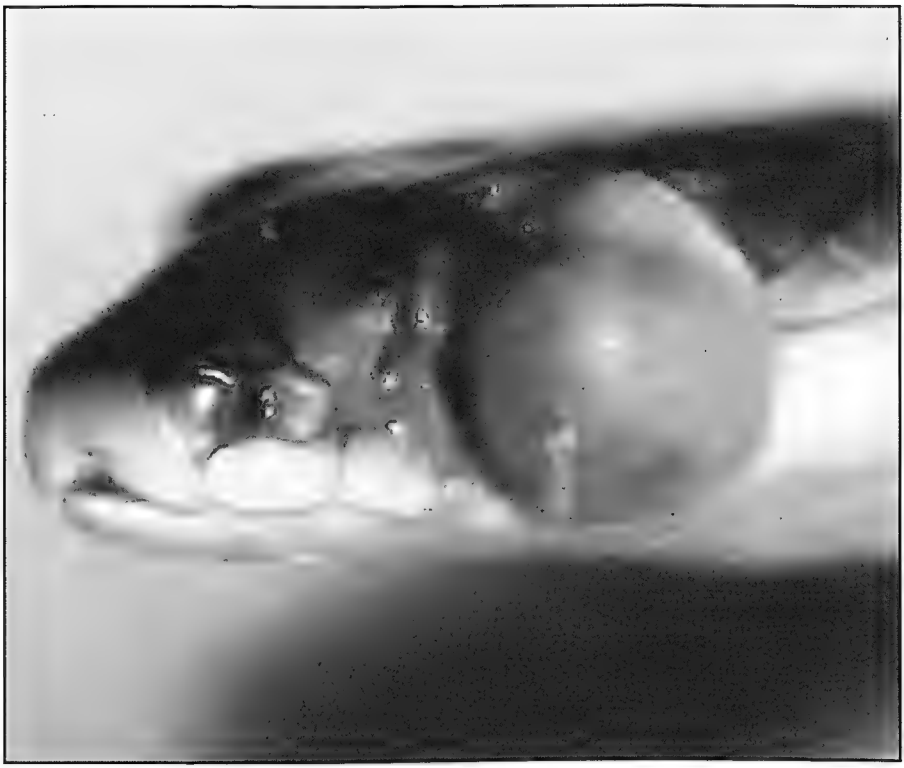


Figure 3. Orbital proptosis in one hatchling, left lateral view.



DISCUSSION

Extensive ecological and breeding studies in *D. punctulata* have uncovered much of its reproductive behaviour; however this has been limited to breeding cycles, mating behaviour, and the relationship between body size and clutch size from observation of adult individuals (Shine, 1991; Fearn & Trembath, 2010). From the well-developed individuals euthanized at the site and eggs hatching within five days after incubation, the entire cluster was close to hatching prior to collection. Our egg and hatchling sizes, though at the upper limit of estimates, correspond with records from Shine (1991). The size and dimensions of the two desiccated casings at the site also conform to these records. The aged condition of the two empty casings found at the site suggests *D. punctulata* may have used this site previously, however two is a very low number of eggs for this species. It is likely that insects may have destroyed and consumed these eggs earlier in the season, particularly since they were found close to the nest entrance/cut site and were therefore most accessible. Alternatively, these may be of a separate species of snake coincidentally nesting in the same cavity.

Despite the significant trauma and exposure, all undamaged eggs collected survived. *Dendrelaphis punctulata* has been recorded laying 4-16 eggs in captivity (Shine, 1991). The large number of eggs in the cavity (50) indicates that these eggs were the product of multiple individuals and we estimate between 4 to 13 females were involved. The single euthanized individual is the first record of

Table 1. Measurements of eggs (length x diameter) and hatchlings (snout-vent length and total length). Egg number and hatchling number do not correspond.

Egg #	Length (mm)	Diameter (mm)	Hatchling #	SVL (mm)	TL (mm)
1	53	21	1	271	372
2	49	19	2	289	401
3	46	18	3	251	312
4	44	17	4	278	359
5	45	17	5	272	363
6	45	18	6	262	354
7	42	18	7	272	374
8	54	18	8	276	370
9	43	19	9	277	383
10	51	20	10	274	376
11	43	21	11	257	351
12	45	19	12	261	359
13	35	20	13	272	374
14	37	18	14	239	325
15	44	19	15	256	345
16	53	22	16	296	373
17	44	16	17	276	380
18	40	20	18	256	354
19	51	21	19	275	383
20	48	22	20	261	359
21	36	20	21	265	359
22	37	17	22	266	362
23	41	23	23	245	333
24	47	23	24	258	351
25	51	18	25	245	351
26	47	19	26	275	336
27	40	19	27	239	371
28	41	20	28	251	331
29	40	21	29	242	344
30	38	18	30	269	330
31	50	17	31	257	361
32	39	18	32	266	349
33	44	22	33	271	361

Egg #	Length (mm)	Diameter (mm)	Hatchling #	SVL (mm)	TL (mm)
34	38	22	34	272	367
35	44	20	35	251	370
36	38	22	36	263	338
37	46	23	37	256	342
38	36	20	38	252	350
39	47	20	39	258	355
40	47	19	40	254	343
41	39	16	41	250	346
42	41	17	42	282	384
43	49	20	43	254	348
44	44	17	44	245	342
45	42	16	45	265	360
46	44	19	46	246	344
47	39	18	47	261	352
48	36	17	48	248	344
Mean	**43.60**	**19.25**		**262.02**	**356.06**

exopthalmia in *D. punctulata*. However, congential exopthalmos has been recorded in the Rhinoceros Viper (*Bitis nasicornis*) and in American alligators (*Alligator mississippiensis*) (Sabater & Marisa Pérez, 2013)

Although aggregations of individuals are known to occur (Schembri, 2007; Fearn & Trembath, 2010), this is the first observation of communal laying behaviour in *D. punctulata*. Communal behaviour is common in this species. Groups of individuals repeatedly aggregate at the same overwintering sites, presumable for thermoregulatory benefits (Schembri, 2007). This not only indicates some degree of communal behaviour, but, if the desiccated eggs are from a previous season, the potential for spatial memory and repeated use of communal nests (Holtzman, 1998; Schembri, 2007; Peterson & Rohr, 2010).

Though common among other squamates, communal nesting is characteristic of very few Australian snakes. A notable exception is the Yellow-faced Whip Snake *Demansia psammophis*, a common small terrestrial elapid. This species has frequently been found to nest in communal ground burrows, with cases of 200 to 600 eggs recorded (Covacevich & Limpus, 1972; Scanlon, 1982; Doody *et al.*, 2007). Communal nesting appears to be a highly successful strategy, offering a significant survival advantage to offspring. Questions remain as to why, if it is so advantageous, this behaviour is less frequent, and how this behaviour arises in a species or population (Doody *et al.*, 2009; Peterson & Rohr, 2010).

Communal nesting is generally thought to occur for one of two reasons. The habitat restriction hypothesis invokes a shortage of suitable nesting sites for each female in the population, while several adaptive hypotheses promotes the various adaptive benefits of communal nesting, such as predation abatement by increased numbers or improved temperature gradients in a communal nest (Doody *et al.*, 2009). Inspection of the site found many trees with extensive evidence of termites, grassfire and trunk damage, sug-

gesting similarly suitable nest sites may be present at this locality. This suggests the habitat restriction hypothesis to be unlikely with adaptive hypotheses such as "attack abatement" being more probable, but what we consider suitable habitat is an aesthetic evaluation of the site and should be interpreted with caution. It also remains to be determined whether communal nesting is typical of this species and whether repeated use of communal nesting sites is commonplace, as with other Australian reptiles (Covacevich & Limpus, 1972; Radder & Shine, 2007; Peterson & Rohr, 2010). Although this is the only nesting site recorded for *D. punctulata*, it seems reasonable that this arboreal species would utilise tree crevices and hollows as nesting sites over burrowing. This finding casts doubt on the hypothesis that seasonal reproduction in *D. punctulata* relates to soil humidity through nesting in ground burrows (Fearn & Trembath, 2010). Radiotelemetry of another arboreal colubrid, the Rough Green Snake (*Opheodrys aestivus*) in North America, revealed similar nesting behaviour, with extensive use of small crevices in living trees as the only nesting sites used by all five study individuals (Plummer, 1990). Plummer (1990) found that although captive *O. aestivus* chose moist substrates in captivity, humidity levels in arboreal nests were within the optimal bounds for egg development, negating the need for humid substrates. Eggs developed successfully under a wide range of humidity regimes, indicating relative plasticity of necessary humidity levels during development in this species. Our finding and the absence of ground burrowing records in *D. punctulata* suggest seasonality of reproduction may require another explanation.

With a diet consisting predominantly of anurans, the alternative hypothesis, that seasonality of reproduction is a consequence of an abundance of prey items, seems possible (Shine, 1991; Fearn & Trembath, 2010). The seasonal abundance of neonate prey items increases reproductive success in several snake species, including the Water Python (*Liasis fuscus*), with more individuals breeding after rainy seasons due to an increase in native rat populations and increased mortality of small pythons after dry periods due to the absence of juvenile rats (Shine & Madsen, 1997; Fitzgerald *et al.*, 2004; Madsen *et al.*, 2006). Annual rainfall patterns in northern Australia also correlate with abundance of anuran prey and concurrently with the peak reproductive period of another colubrid, the Freshwater Snake *Tropidonophis mairii* (Brown & Shine, 2007). However, while anuran prey and reproduction peak concurrently, reproductive seasonality in *T. mairii* appears to be driven by soil humidity post wet season for appropriate incubation conditions. Furthermore, the correlation between seasonality and reproductive success seems pronounced in species taking larger prey such as birds and mammals, where adult prey may be too large for neonate snakes to consume (Fitzgerald *et al.*, 2004). While food preference may vary geographically in *D. punctulata;* anurans and small lizards constitute their main prey items, and with a variety of small and large prey species, such size restrictions are unlikely to cause seasonality in feeding and reproduction (Shine, 1991).

As demonstrated by Shine (1991) by dissection of museum specimens and maintenance of gravid snakes in captivity, Green Tree Snakes in their southern range are reproductively similar to the Brown Tree Snake (*Boiga irregularis*). In the Southern range of the distribution of both species, ovulation and oviposition occur in the summer months. This supports the hypothesis that *D. punctulata* may time oviposition to coincide with appropriate incubation requirements. Specifically, because this species utilized tree hollows as nest sites, it cannot rely on relatively stable soil humidity like the year-round breeding *T. mairii*. The seasonality of this species' breeding cycle may be timed to take advantage of ambient humidity and nest temperature within tree hollows during Summer months, particularly in their Southern range where lower temperatures and humidity may restrict incubation opportunities to relatively short periods of high rainfall and high humidity

(Fearn & Trembath, 2010). This hypothesis is further supported by Shine's observation that *D. punctulata* in the Northern Territory are reproductively active year-round (Shine, 1991). This year-round breeding in the northern range of the species supports our hypothesis of temperature and humidity restricting breeding as these would not be limiting factors in the the warmer, humid conditions in Australia's tropical North.

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UNEXPECTED RECORDS OF THE PINK-TAILED WORM LIZARD *APRASIA PARAPULCHELLA* (PYGOPODIDAE) IN CHENOPOD SHRUBLAND, HAY REGION, NSW.

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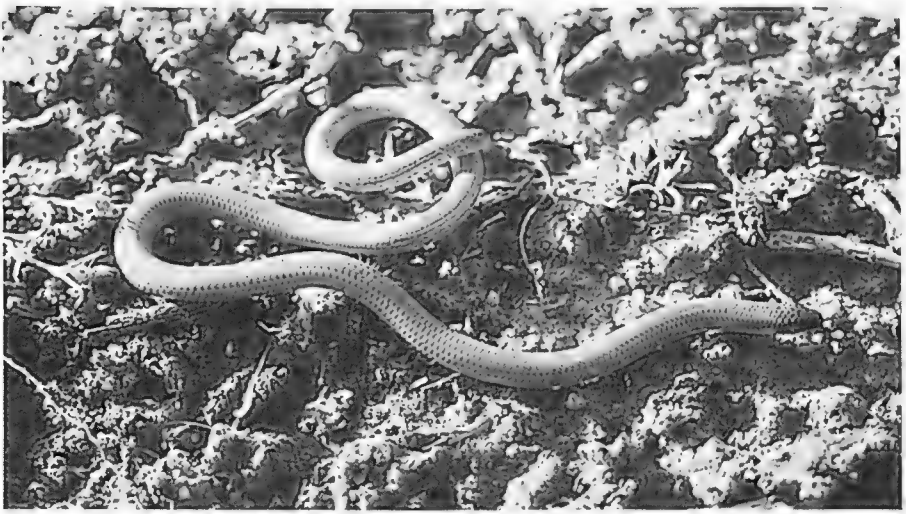
The family Pygopodidae (flap-footed lizards) in Australia contains 41 species in seven genera (*Aprasia, Delma, Pygopus, Lialis, Ophidiocephalus, Paradelma* and *Pletholax;* Wilson & Swan, 2010). The genus *Aprasia* contains twelve slender, worm-like species, all of which have restricted geographical ranges and a tendency to burrow beneath rocks, logs and stumps (Wilson & Swan, 2010). Many species in the genus are found within the nest of various species of ant, the eggs and larvae on which they feed (Webb & Shine 1994; Robinson, 1996; Jones, 1999). Six species of *Aprasia* are listed as threatened under State or Commonwealth legislation largely due to their restricted distribution. The Pink-tailed Worm Lizard *Aprasia parapulchella* Kluge, 1974 is the most south-easterly occurring species in the genus and occurs as disjunct populations along the western foothills of the Great Dividing Range between Bendigo in Victoria and Gunnedah in New South Wales (Wong *et al.*, 2011). The species is classified as Endangered in Victoria (FFG Act 1985) and listed as Vulnerable under NSW and Commonwealth threatened species legislation (EPBC Act 1999). In this note, we report a record of *A. parapulchella* from a grazing property between the Cobb and Mid Western Highways approximately 45 km NNE of Hay

Figure 1. Pink-tailed Worm Lizard *Aprasia parapulchella* recorded on private property 45 km NNE of Hay, Murrumbidgee catchment, southern NSW (Photo: Matthew Herring).



in the Murrumbidgee catchment, southern New South Wales (34°06'52.18"S 144°56'32.87"E, 91 m above sea level).

On 11 September 2011, one of the authors (MH) was conducting surveys on the Hay Plains, when at 0900 hours, a single *A. parapulchella* was discovered in a nest of small black ants. The ant nest was located beneath a metal star picket which had been installed by other researchers approximately eight years earlier (Steve Sass, pers. comm., October 2012) and had subsequently fallen over. When the star picket was repositioned, the ant nest was disturbed, revealing an individual *A. parapulchella* sheltering within the mound. From examining the characteristic features assigned by Cogger (2000), the specimen keyed out to *A. parapulchella* in having 14 mid body scales and the first upper labial scale wholly fused to the nasal scale (Figure 1). The temperature was 15°C and the relative humidity was 82%, the highest recording for the month (www.bom.gov.au/climate/dwo/201109/html). The soil was moist following 1 mm of rain the previous night and above average rainfall over the month of August (47.4 mm in August 2011 *c.f.* 32.3 mm August mean). A voucher specimen was not taken due to the absence of a collection permit.

The vegetation of the area is classified as Riverine Chenopod Shrubland (*sensu* Keith, 2004) and is dominated by a mosaic of low-growing shrubs, including *Rhagodia spinescens, Atriplex nummularia, Maireana* sp. and *Sclerolaena* sp. (Figure 2). The ground layer is dominated by pigface *Disphyma* sp., fine woody debris (including leaf litter) and areas of bare ground. Notably, the habitat is characterised by the absence of trees, native grass, surface rocks or logs. The area currently experiences light grazing and at the time of the survey was recovering from a prolonged period of drought.

This new record of *A. parapulchella* would represent a range extension of approximately 250 km west of historical records from Buddigower Nature Reserve based on a recent review (Wong *et al.*, 2011). However, a search of the Atlas of Living Australia data-

Figure 2. Habitat of the Pink-tailed Worm Lizard *Aprasia parapulchella* on the treeless Hay Plains, southern NSW, illustrating the structural environment of Riverina Chenopod Shrubland (Photo: Matthew Herring).

base revealed a previously overlooked specimen collected by B. Lewis from the Hay region (34°06'50"S 144°56'24"E) and lodged with the Australian Museum (catalogue number R163348) on 16 October 2004 (www.ala.org.au). Our new record is from almost the same location, approximately 250 m east of the AM record. Both the AM specimen and our new record are significant because, until now, *A. parapulchella* was not known to occur in chenopod shrubland. All published accounts of *A. parapulchella* are from grassy woodland, dry forest and derived grassland communities which support native or exotic grass, few or no trees and shrubs, and large amounts of surface rock (Osborne & McKergow, 1993; Michael & Herring, 2005; Brown *et al.*, 2011). Regional differences in habitat among studies indicate the above environmental attributes are not always present at each site. For example, surface rocks are absent from several *A. parapulchella* sites in the Bendigo region (Robertson & Heard, 2008) and also West Wyalong (Jones, 1999), and several derived grassland sites in the ACT are devoid of trees (Jones, 1992). The current opinion is that *A. parapulchella* tends to avoid areas with high shrub cover (Robertson & Heard, 2008; Wong *et al.*, 2011). The new records from the Hay region challenge this view, as low shrubs are the main vegetation stratum present. However, due to the lack of rocks and logs to search beneath, pitfall traps or the installation of artificial refuges (cover objects) may be required to detect the species in structurally simple environments.

Based on the extent of Riverine Chenopod Shrubland in NSW (and associated ant species) it is likely that *A. parapulchella* has a much wider distribution than currently recognised and may be relatively common in western NSW. However, Riverine Chenopod Shrubland has had a long history of overgrazing by livestock and the introduced European Rabbit *Oryctolagus cuniculus* and much of the community is in a degraded condition (www.environment.nsw.gov.au). Hence, there is urgent need to better understand the habitat requirements and geographical range of *A. parapulchalla* in NSW, especially in the extensive shrublands of western NSW. Artificial refuges (e.g. roofing tiles or corrugated steel) are effective methods for procuring records of cryptic and fossorial species, including *A. parapulchella* which has been detected beneath roofing tiles and corrugated steel during reptile surveys near Albury and Yass (Michael *et al.*, 2012). Artificial refuges could therefore be a useful tool in future surveys for the species. In addition, based on the recent increase in the number of new records of the species in NSW (Wong *et al.*, 2011; Dan Florence pers. comm., October 2012), the conservation status of *A. parapulchella* in NSW may require re-evaluation.

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AN ETYMOLOGY OF THE SCIENTIFIC NAMES OF AUSTRALIAN AMPHIBIANS

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ABSTRACT

The meanings of the names of the currently accepted amphibian genera and species known from Australia are elucidated, with supporting evidence where possible from the authors of the names.

INTRODUCTION

'Well, "slithy" means "lithe" and "slimy"...You see it's like a portmanteau - there are two meanings packed up in one word.'

- Lewis Carroll, *Through the Looking Glass*, chapter 6

The names of animal genera and species are constructed mainly from Greek and Latin words, but also from people's names and other sources, and many have been obscured by the passage of time. This paper sets out as much as I can establish about the etymology of the names of all extant amphibian genera and species known from Australia, as listed by ABRS (2014).

Etymologies and translations of the scientific names of animals are often included in catalogues, field guides and the like, but they are often erroneous. It is not always easy to understand the original intentions of authors of names, and the stems used to construct names are sometimes obscure, or have more than one meaning, or perhaps no meaning at all. Sometimes the choice of name had little if anything to do with a feature that distinguished the taxon from others, but merely reflected a feature from which a convenient name could be constructed. Furthermore, the originally rationale for distinguishing one taxon from another might be very often at odds with modern taxonomic concepts and might therefore make the name more or less diagnostically meaningless.

Where possible I have gone to the original publication to determine the author's intention. In the few cases where that has not been possible I have tried to find the author's explanation in a later work, or an explanation by another zoologist as near in time to the original publication as possible.

Most names are based on Greek words or are Latinised Greek, so I have given the Greek unless the name is from pure Latin or some other language. For simplicity words are given here in anglicised Greek rather than classical Greek, and the aspirated h is included in the spelling where necessary, as in *hydros*. For Greek words I have relied upon Bagster (1870), Liddell *et al.* (1968) and Morwood and Taylor (2002). For Latin I have relied upon Lewis (1891).

The termination of specific epithets that were formed as nouns in apposition (e.g. *Crinia nimbus*) or might have been but the author/s did not explicitly say so (e.g. *Cyclorana vagitus*) are sometimes altered to agree in gender with the genus name, but this is specifically disallowed under Article 34.2.1 of the International Code for Zoological Nomenclature (ICZN, 1999). Furthermore, the gender of a genus is not always obvious, and confusion sometimes results in the assignment of an incorrect gender to an epithet or an inappropriate attempt to emend a name. Because of this I have indicated epithets that should be considered nouns in apposition, and also the gender of each genus as defined by the Code. Where names involve the misapplication of Latin (e.g. *Litoria rheocolus*) I have retained the original spelling, as my intention is not to emend such names even if that were possible.

Scientific and colloquial names are those accepted by ABRS (2014), or those recommended by the authors or in use in the literature where ABRS gives none. However, erroneously altered epithets, as discussed above, are replaced with the epithets published by the original authors. Most of the colloquial names used by ABRS are those compiled by Clayton *et al.* (2006).

Finally, I must point out that several very significant corrections and additions to this paper were made by the two anonymous reviewers. These are acknowledged in the text, as it would be inappropriate to claim these as my own work.

ETYMOLOGIES

Adelotus Ogilby, 1907 (m.) - *adelos* (invisible) + *otos* (ear), alluding to the fact that the tympanum is 'entirely covered by the skin, situated behind and above the angle of the mouth' (Günther, 1863a: 28). The etymology parallels that of the original name that Günther gave to the genus, *Cryptotis* Günther, 1863 - *kryptos* (hidden) + *otos* (ear) - which was 'rendered unavailable through its use in *Crustacea* by Dana, 1852' (Ogilby, 1907: 27). *Cryptotis* Dana, 1852 was in fact also unavailable because of *Cryptotis* Pomel, 1848 (Mammalia). The name has sometimes been mistakenly interpreted to mean merely 'hidden' or 'unseen', without recognising the allusion to the tympanum.

brevis (Günther, 1863) (Tusked Frog) - Latin *brevis* (short), clearly alluding to the legs: 'Legs rather short...' (Günther, 1863a: 28).

Arenophryne Tyler, 1976 (f.) - Latin *arena* (sand) + Greek *phryne* (toad), alluding to the type locality and the outward similarity to genus *Pseudophryne*: 'It was situated on the edge of coastal sand dunes and it was amongst these dunes that all of the frogs were found... At first glance *Arenophryne* could be mistaken for a short-legged *Pseudophryne* species.' (Tyler, 1976: 48).

rotunda Tyler, 1976 (Sandhill Frog) - Latin *rotunda* (round, rotund), obviously referring to the very rotund shape of the frog, although Tyler (1976: 46) did not state the etymology specifically.

xiphorhyncha Doughty & Edwards, 2008 (Southern Sandhill Frog) - 'The specific name is a Latinized version of the Greek *xiphos* (sword) + *rhynchos* (nose or snout), in reference to the sharper snout of *A. xiphorhyncha* compared to *A. rotunda*.' (Doughty & Edwards, 2008: 126). A reviewer noted that this is a slight exaggeration, as the snout of *A. xiphorhyncha* is a little longer and narrower than that of *A. rotunda*, but still very blunt and not sword-like.

Assa Tyler, 1972 (f.) - 'Assa (L.) (f.) = dry nurse. It refers to the habit of caring for young without providing nourishment.' (Tyler, 1972: 200). A dry nurse is one who cares for an infant but does not provide breast milk. The tadpoles develop to metamorphosis in specialised pouches on the male's flanks.

darlingtoni (Loveridge, 1933) (Marsupial or Pouched Frog) - After American zoologist Philip Jackson Darlington (1904-1983), who collected the type from the MacPherson Range in Queensland (Loveridge, 1933a: 58). Darlington came to Australia with the 1931 Harvard expedition, and stayed on to collect along the east coast from Sydney to Cape York in 1932 (Loveridge, 1934, 1935). Edward O. Wilson wrote a wonderful account of Darlington's life and his outstanding contributions to zoology, which all budding field biologists should read (Wilson, 1991).

Austrochaperina Fry, 1912 (f.) - Latin *auster* (the south) + genus *Chaperina*, referring to the southern distribution and the similarity to the tropical genus *Chaperina*: 'These frogs represent a new genus whose affinities are with *Chaperina*, Mocquard, found in Borneo and New Guinea, and for which I propose the name *Austrochaperina*.' (Fry, 1912: 87).

adelphe (Zweifel, 1985) (Northern Territory Frog) - 'The Greek *adelphe*, meaning

"sister" and used as a noun in apposition, indicates the inferred relationship of this species to its sibling *Sphenophryne gracilipes*.' (Zweifel, 1985: 280). Zweifel (ibid.: 281) noted that he could not distinguish the two species on morphological grounds, but that the calls were markedly different.

fryi (Zweifel, 1962) (Fry's Frog) - After Dene Barrett Fry (1893-1917), who first described the species as *Austrochaperina brevipes* (Fry, 1915: 61). However, Fry's name was a junior primary homonym of *Austrochaperina brevipes* (Boulenger, 1897), so Zweifel renamed the species using Fry's surname, in line with common practice. Dene Fry was a junior demonstrator in zoology at The University of Sydney, and was describing species before he was 20 years old. He enlisted with the Australian Army Medical Corps in 1915 but later transferred to the 3rd Battalion AIF. He was killed on 9 April 1917 in the desperate battle for Hermies in France (AWM, 2011), eight months after his brother Alan had died of wounds after the horrific battle for Pozières. Both are commemorated in a stained glass panel in the Killara Uniting Church in Arnold Street, Killara, New South Wales, which includes the inscription: 'Dene Barrett Fry, 3rd Batt. AIF, 9th April 1917, Hermies, France; Alan Fraser Fry 13th Batt. AIF, 14 Aug 1916, Pozieres, France. Be thou faithful unto death and I will give you a crown of life. A loving tribute of their parents and family.' His death was surely one of the greatest losses to Australian zoology.

gracilipes Fry, 1912 (Slender Frog) - Latin *gracilis* (slender) + *pes* (foot), alluding to the slender toes: 'This species is distinguished from both the preceding species by... the longer toes...' (Fry, 1912: 94).

pluvialis (Zweifel, 1965) - 'The name *pluvialis* alludes to the rain-forest habitat of this species.' (Zweifel, 1965: 8). Zweifel (1985: 295) described the habitat as 'vine forest, ranging from simple notophyll vine forest to complex mesophyll vine forest'. Latin *pluvialis* literally means 'rainy'.

robusta Fry, 1912 (Robust Frog) - Latin *robustus* (robust, stout), from the shape of the body: 'Habit moderate or stout.' (Fry 1912: 89).

Cophixalus Boettger, 1892 (m.) - *kophos* (blunt) + genus *Ixalus*, referring to the blunt snout of the type species, *Cophixalus geislerorum* Boettger, 1892: 'Schnauze kurz...vorne abgestutzt' [Snout short...front truncated] and presumably the outward similarity to the northern hemisphere genus *Ixalus* Duméril & Bibron, 1841 (Boettger, 1892: 24). As a reviewer pointed out, Boettger would have been very familiar with the genus *Ixalus* and would naturally coin a name that would be useful for European herpetologists. *Ixalus* Duméril & Bibron, 1841 - rendered unavailable by *Ixalus* Ogilby, 1837 (Mammalia) - is derived from *ixalos* (dancing, springing into the air) (Duméril & Bibron, 1841: 523), and was coined to replace *Orchestes* Tschudi, 1838 (*orchestes* = dancing), which was rendered unavailable by *Orchestes* Illiger, 1798 (Coleoptera).

aenigma Hoskin, 2004 (Tapping Nursery Frog) - 'From the Latin *aenigma* = a riddle, what is obscure or a mystery; referring to the inclusion of this species among the type series and subsequent collections of *C. concinnus* and the confusion this has created.' (Hoskin, 2004: 249). The epithet is a noun in apposition and therefore should not be altered.

australis Hoskin, 2012 (Southern Ornate Nursery Frog) - 'From the Latin *australis* for 'southern', in reference to the fact that this species occurs in the southern half of the Wet Tropics region.' (Hoskin, 2012: 4). The holotype was collected from Mt Spec in the Paluma Range (the southernmost range of the Wet Tropics), and paratypes were collected farther north from the Thomson Range, Kirrama Range and Mission Beach.

bombiens Zweifel, 1985 (Buzzing Frog) - 'The name *bombiens*, Latin for "buzzing", is descriptive of the male frog's call.' (Zweifel, 1985: 306). Zweifel (ibid.: 307) described the call as 'a brief buzz'.

concinnus Tyler, 1979 (Elegant Frog) - 'The specific name is a Latin word meaning elegant, beautiful or fine. It has been selected because of the nature of the lateral and ventral markings of this species.' (Tyler, 1979: 120).

crepitans Zweifel, 1985 (Rattling Frog) - 'The Latin adjective *crepitans* means "rattling", and refers to the sound of the frog's call.' (Zweifel, 1985: 316). Zweifel (loc. cit.) described the call as 'a rattle about 2 seconds long, composed of paired clicks'.

exiguus Zweifel & F. Parker, 1969 (Scanty Frog) - Latin *exiguus* (small), referring to the relatively small size compared to similar species: 'The Latin *exiguus*, an adjective meaning small, is appropriate for this species, as it is one of the smallest species in its genus.' (Zweifel & Parker, 1969: 9).

hinchinbrookensis Hoskin, 2012 (Hinchinbrook Island Nursery Frog) - 'The name is derived from the fact that this species occurs only on Hinchinbrook Island, with the *ensis* extension being latin for 'belonging to'.' (Hoskin, 2012: 10).

hosmeri Zweifel, 1985 (Hosmer's Frog) - 'The species is named for William Hosmer, in recognition of his many contributions to Australian herpetology, which include collecting the majority of the specimens of this species.' (Zweifel, 1985: 321). English-born Queensland herpetologist Bill Hosmer (1925-2002) was an expert taxonomist, collecting in a wide range of places, his specimens including taipans for antivenom production (Mirtschin, 2006: 908). He founded the Herpetologists' League of North Queensland and was its first president (Anon, 1954), and contributed a large body of research to amphibian taxonomy.

infacetus Zweifel, 1985 (Inelegant Frog) - 'The Latin adjective *infacetus* - meaning rude, unmannerly - refers to the sound of the frogs call.' (Zweifel, 1985: 324). The call certainly sounds like a 'raspberry'. Zweifel described it as 'a series of clicks lasting about 1 second with the mean pulse (click) rate varying from about 60 to 110 per second' (Zweifel, 1985: 326). Tyler (1992: 96) gave the meaning of the name as 'inelegant', which is perhaps too polite.

kulakula Hoskin & Aland, 2011 (Kutini Boulder Frog) - 'From *kul'a kul'a*, meaning 'rocky place' in Kuuku Ya'u, a language of the Sandbeach People of Eastern Cape York. This epithet was suggested by Mr Ronald Gilbert, custodian of the Kutini clan estate in which the first specimens were discovered. The species epithet is used as a noun in apposition.' (Hoskin & Aland, 2011: 42).

mcdonaldi Zweifel, 1985 (McDonald's Frog) - 'The species is named for Keith McDonald of the Queensland National Parks and Wildlife Service in recognition of his important collections of microhylid frogs, and of his generosity in sharing his specimens, time, and information with me and with others who have studied the Queensland herpetofauna.' (Zweifel, 1985: 328). Keith McDonald is well known for his dedication to the conservation of threatened species in Queesland, and is currently an honorary research associate at the Queensland Museum. He was awarded the Queensland Museum Medal in 2000.

monticola Richards, Dennis, Trennery & Werren, 1994 (Mountain-top Nursery Frog) - 'From the Latin *monticola* = dweller in the mountains, referring to the species' high-mountain habitat.' (Richards *et. al.*, 1994: 310). The type and paratypes cited by the authors were all collected above 1100 metres in northern Queensland.

neglectus Zweifel, 1962 (Neglected Frog) - Latin *neglectus* (neglected), presumably referring to the fact that the species had been overlooked until Zweifel (1962: 15) described it, although he did not state the etymology explicitly.

ornatus (Fry, 1912) (Ornate Frog) - Latin *ornatus* (adorned, decorated), from the colouration: 'This species differs from the preceding *[Austrochaperina robusta]* chiefly in the smaller tympanum, much larger finger

discs, very small first finger, and distinctive colouration.' (Fry, 1912: 93). Hoskin (2012: 12) called this species the Northern Ornate Nursery-frog, to distinguish it from *L. australis*.

pakayakulangun Hoskin & Aland, 2011 (Golden-capped Boulder Frog) - 'From the Kuuku Ya'u words *pakaya* - down/inside/under, *ku'a* - rocks/boulders, *ngun* - belonging to. The name translates approximately to 'belonging among the boulders'. The specific epithet was suggested by Mrs Suzie Pascoe and Mrs Lucy Hobson in liaison with Rev. David Thompson. Mrs S. Pascoe and L. Hobson are recognised among the custodians of Kuuku Ya'u country.' (Hoskin & Aland, 2011: 46).

peninsularis Zweifel, 1985 (Cape York Frog) - 'The specific epithet is chosen in reference to the species' occurrence on the Cape York Peninsula.' (Zweifel, 1985: 345).

petrophilus Hoskin, 2013 (Blotched Boulder Frog) - 'From the Latin, petrophilus refers to 'rock-loving', in recognition of the restriction of this species to boulder-field habitat. The species epithet is treated as a noun in apposition.' (Hoskin, 2013: 63). The word *petrophilus* does not in fact exist in Latin. Both the Latin and Greek word for rock is *petra*, but *petro-* is a wholly Greek combining form, and *philus* is not Latin but Latinised Greek *philos*. For the epithet to be a noun in apposition, the termination *philus* would have to be taken to be a noun in the lyrical sense of love or affection, as Lord Amiens sings of it in Shakespeare's *As You Like It* (Act II, scene vii): 'Most friendship is feigning; most loving, mere folly'. That is, 'rock-loving' as given by the author would have to be interpreted as '[the] love of rock', which seems a little odd.

saxatilis Zweifel & F. Parker, 1977 (Rock Frog) - 'The specific name *saxatilis* is a Latin adjective meaning rock-dwelling, in reference to the habitat on Black Mountain.' (Zweifel & Parker, 1977: 6).

zweifeli Davies & McDonald, 1998 (Cape Melville Frog) - 'This species is named for Richard G. Zweifel, former Curator of Herpetology at the American Museum of Natural History, New York, whose revision of the Australian microhylids is a standard reference. We honour his contribution to herpetology and his friendship.' (Davies & McDonald, 1998: 163).

Crinia Tschudi, 1838 (f.) - *krine* (separated, divided), alluding to the free (i.e. separated rather than joined by webbing) toes in the type species, *Crinia georgiana* Tschudi, 1838: 'Dieses Genus repräsentirt die Frösche mit freien Zehen in Australien...' and 'digitos graciles, longiusculos, liberos' ['This genus represents the free-toed frogs in Australia...' and 'fingers slender, long, free'] (Tschudi, 1838: 38, 78). A common suggestion is that the name refers to a waterlily pad (e.g. Tyler, 1992: 40; Robinson, 1993: 24), presumably on the basis of *krinon* = lily, but that is clutching at a linguistic straw since *krinon* clearly refers to *Lilium candidum*, the common white lily of Europe (Liddell *et al.*, 1968).

bilingua (Martin, Tyler & Davies, 1980) (Bilingual Frog or Froglet) - 'The specific name *bilingua* alludes to the production by males of two distinct calls.' (Martin *et al.*, 1980: 98); '... males start with short, high-pitched calls 0.3 seconds long and switch to long trills. An entire chorus may change from one type of call to another within seconds.' (Tyler, 1992: 41).

deserticola (Liem & Ingram, 1977) (Desert Froglet) - 'The specific name is derived from the latin *desertus* meaning waste, and the latin suffix, *cola*, meaning an inhabitant. The name refers to the habitat of the frog.' (Liem & Ingram, 1977: 258).

fimbriata Doughty, Anstis & Price, 2009 (Kimberley Froglet) - '*Fimbria* is Latin for 'fringed' in reference to fringes on adult males observed in this species. Used as a noun in apposition.' (Doughty *et al.*, 2009: 141). The fringes referred to are flanges on all fingers and the first toe.

flindersensis Donnellan, Anstis, Price & Wheaton, 2012 (Northern Flinders Ranges Froglet) - From the type locality, Bunyeroo Gorge in the Flinders Ranges, South Australia (Donnellan *et al.*, 2012b: 17).

georgiana Tschudi, 1838 (Tschudi's Froglet) - From the type locality, King George Sound, Western Australia: 'Quoy und Gaymard brachten diese Species von Port du Roi Georges ...' [Quoy and Gaymard collected this species from King George Sound...] (Tschudi, 1838: 38).

glauerti Loveridge, 1933 (Glauert's Froglet) - After Ludwig Glauert (1879-1963), at that time keeper of the biological collections at the Western Australian Museum in Perth. Glauert undoubtedly provided two of the paratypes cited by Loveridge (1933a: 57). He was trained as a geologist and initially worked as a palaeontologist, but later worked extensively on the Western Australian fauna (Jenkins, 1983). He was appointed director of the museum in 1954.

insignifera Moore, 1954 (Sign-bearing Froglet) - A simple variant in order to create a new name for the Western Australian frog previously included in *Crinia signifera*: 'There is no name among the many synonyms of *Crinia signifera* that could be revived for the West Australian form. A new name, therefore, is proposed.' (Moore, 1954: 71). The English name currently applied to the frog is inappropriate, since technically the scientific name means the exact opposite. A simple solution would be to call this species the Western Sign-bearing Froglet. However, see *Crinia signifera* in relation to the meaning of *signifera*.

nimbus (Rounsevell, Ziegeler, Brown, Davies, & Littlejohn, 1994) (Moss Frog or Froglet) - 'From the Latin *nimbus* (= rain cloud), with reference to the habitat of the species.' (Rounsevell *et al.*, 1994: 181). The epithet is a noun in apposition. The species was originally placed in a separate genus *Bryobatrachus*, derived 'from the Greek *bryon* (= moss) and *batrachos* (frog), alluding to the habit of breeding in moss or moss-like vegetation' (Rounsevell *et al.*, 1994: 173). According to one reviewer, its 'assignment to the genus *Crinia* by Read *et al.* (2001) has not been universally accepted.

parinsignifera Main, 1957 (Eastern Sign-bearing Froglet) - Latin *para* (beside) + species *insignifera*, an allusion to the similarity to that species, particularly in the call of the male, which was described perfectly by Main: 'VOICE. - Extremely similar to that of *insignifera* (may be likened to the noise produced by drawing a wet finger over an inflated rubber balloon).' (Main, 1957a: 54).

pseudinsignifera Main, 1957 (False Western Froglet) - *pseudos* (false) + *insignifera*, alluding to the similarity to that species: 'Morphologically similar to other members of the *insignifera* super-species from which it is distinguished by male call and hybrid inviability...' (Main, 1957a: 52).

remota (Tyler & F. Parker, 1974) (Remote Froglet) - Latin *remota* (far away), alluding to the fact that the species was geographically isolated from other species of *Ranidella* (the genus in which it was first described) then known (Tyler & Parker, 1974: 75-76).

riparia Littlejohn & Martin, 1965 (Streambank Froglet) - Latin *riparia* (belonging to a river bank), alluding to the habitat: 'This new species was found along a rocky watercourse in the Alligator Gorge, Lower Flinders Ranges.' (Littlejohn & Martin, 1965: 319).

signifera Girard, 1854 (Common Eastern Froglet, Common Froglet) - Latin *signifer* (sign-bearing, i.e. carrying the zodiacal constellations, starry), I think alluding to the spotted appearance of the skin: 'Skin above subtuberculous, beneath glandulous.' (Girard, 1854: 422) and, as a reviewer noted, perhaps the striped appearance in some colour forms, resembling the broad stripe of the zodiac in the night sky.

sloanei Littlejohn, 1958 (Sloane's Froglet) - 'The name is designated in appreciation of the assistance of Mr. Ian F. Sloane, of "Savernake Station", Savernake, New South Wales, without whose co-operation collection in this area would not have been possible.' (Littlejohn, 1958: 225). Ian Sloane owned and managed Savernake Station (dryland

cereals, wool and prime lamb) from the 1920s to his death in 1986. An ardent environmentalist, he had an instinctive knowledge of flora and fauna on the property. He was also an enthusiastic and skilled photographer and keen historian. Murray Littlejohn married Ian's niece. Savernake Station continues as a model property that combines a rural enterprise with important habitat conservation.

subinsignifera Littlejohn, 1957 (Small Western Froglet) - Latin *sub* (beneath, close, next to) + *insignifera*, alluding to the closeness in form to that species: 'Sibling with *Crinia insignifera* and *Crinia pseudinsignifera;* cannot be distinguished from Parker's (1941) description of *Crinia signifera signifera*.' (Littlejohn, 1957: 22). Littlejohn noted that the species could be distinguished only by its call characteristics.

tasmaniensis (Günther, 1864) (Tasmanian Froglet) - A simple allusion to the geographic locality: '*Hab*. Van Diemen's Land.' (Günther, 1864: 48).

tinnula Straughan & Main, 1966 (Tinkling or Wallum Froglet) - Latin *tinnula* (ringing, tinkling), from the bell-like call: 'A short, high pitched ringing....Tching....Tching like the tinkling of a small bell.' (Straughan & Main, 1966: 21).

Cyclorana Steindachner, 1867 (f.) - *kyklos* (circular, rounded) + Latin *rana* (frog), probably referring to the rather round, stocky shape: 'Körpergestalt sehr gedrungen' (Steindachner, 1867: 29). However, it might equally apply to the rounded tongue of the type species, C. *novaehollandiae*: 'Zunge rund' (Steindachner, loc. cit.).

alboguttata (Günther, 1867) (Striped Burrowing Frog) - Latin *albus* (white) + *guttatus* (speckled). 'Sides of the body and hind part of the thighs black, with numerous round white spots.' (Günther, 1867: 55).

australis (Gray, 1842) (Giant Frog) - Latin *australis* (from the south), alluding simply to the continent of Australia: 'Inhabits the North coast of New Holland.' (Gray, 1842: 56).

brevipes (Peters, 1871) (Short-footed Frog) - Latin *brevis* (short) + *pes* (foot), alluding to the relatively short feet in comparison to those of the two then-known species, C. *australis* and C. *novaehollandiae*, although Peters did not specifically state the etymology, merely noting the lengths: 'Fing. 0m,008; hint. Extr. 0m,039; Fuss mit 4. Zehe 0m,0175.' (Peters, 1871: 648).

cryptotis Tyler & Martin, 1977 (Hidden-ear Frog) - *kryptos* (hidden) + *otis* (ear): 'However, C. *cryptotis* has the tympanum completely covered with skin, whereas it is clearly visible externally in C. *maini* and all other members of the genus.' (Tyler & Martin, 1977: 271).

cultripes H.W. Parker, 1940 (Knife-footed Frog) - Latin *culter* (knife, scimitar) + *pes* (foot), alluding to the 'very large, shovel-shaped inner metatarsal tubercle, a long as, or longer than, its distance from the tip of the inner toe' (Parker, 1940: 22). It is curious, given his description, that Parker did not choose the stem *rutri-*, from *rutrum* (shovel).

longipes Tyler & Martin, 1977 (Long-footed Frog) - Latin *longus* (long) and *pes* (foot), referring to the length of the limbs compared to similar species: '*Cyclorana maculosus* tends to be a shorter-limbed frog...' (Tyler & Martin, 1977: 271).

maculosa (Tyler & Martin, 1977) (Daly Waters Frog) - Latin *maculosus* (mottled, variegated), from the patterning on the back: '...it is its striking dorsal colouration that sets *maculosus* apart from congeners. Namely, the isolated, jet black, patches contrasting with a pale background.' (Tyler & Martin, 1977: 270). As with *alboguttata*, the epithet is adjectival and therefore must have a feminine ending.

maini Tyler & Martin, 1977 (Main's Frog) - After Albert Russell Main (1919-2009), who studied the species extensively and was cited often by Tyler and Martin (1977) in their discussion of the species. Main was at that time Professor of Zoology at the University of Western Australia, later becoming Emeritus Professor and holding various positions with government agencies (Walker, 2010).

manya van Beurden & McDonald, 1980 (Small Frog) - '*'Manya'* is the Aboriginal word for 'small' in the local dialect (Wik-munken) at Coen. This is appropriate for the smallest 'water-holding frog' described.' (van Beurden & McDonald, 1980: 195).

novaehollandiae Steindachner, 1867 (New Holland Frog) - Alluding to Australia, as 'New Holland': '...von Rockhampton, nördlich von Sydney im Binnenlande' (Steindachner, 1867: 30).

platycephala (Günther, 1873) (Water-holding Frog) - *platys* (flat) + *kephale* (head), from the flattened appearance of the head: 'Head large, broad, depressed, with its sides shelving...' (Günther, 1873: 350).

vagitus Tyler, Davies & Martin, 1981 (Wailing Frog) - From the Latin *vagitus* (crying or squalling) and referring to the advertisement call, 'which resembles the plaintive crying of a young baby.' (Tyler *et al.*, 1981c: 155). As pointed out by a reviewer, the epithet vagitus must be treated as a noun in apposition because it may be a noun or an adjective, and the authors did not indicate which. The common alteration to *vagita* is therefore incorrect.

verrucosus Tyler & Martin, 1977 (Rough Frog) - Latin *verrucosus* (warty): '...the Queensland population can be distinguished quite readily by its tendency to exhibit verrucosities on the skin (*C. cultripes* is usually quite smooth)...' (Tyler & Martin, 177: 269). Although Tyler and Martin (1977) published the epithet as *verrucosus*, it is adjectival and therefore should take the feminine form, *verrucosa*.

Geocrinia Blake, 1973 (f.) - geo- (relating to the earth) + genus *Crinia*, presumably from the terrestrial oviposition and the original genus in which the type species was included: 'Oviposition terrestrial. This new genus has been erected to include species which the phenetic analyses have shown to be related to "*Crinia laevis*", as previously described, and remote from the other species of *Crinia*, s.l.' (Blake, 1973: 143).

laevis (Günther, 1864) (Smooth Frog) - Latin *laevis* (smooth), from the nature of the skin: 'Upper and lower parts perfectly smooth.' (Günther, 1864, 48).

leai (Fletcher, 1898) (Lea's Frog) - After the collector of some of the type specimens: '*Hab.*—Bridgetown (Mr. A. M. Lea; seven immature specimens)...' (Fletcher, 1898: 677). Sydney-born Arthur Mills Lea (1868-1932) was an agricultural entomologist who published extensively and travelled widely in Australia, south-east Asia and the Pacific, naming over 6000 insect species. He was appointed government entomologist for Western Australia in 1895, government entomologist for Tasmania in 1899, and finally entomologist to the South Australian Museum, a post he held until his death (Carter, 1932).

lutea (Main, 1963) (Saffron or Walpole Frog) - Latin *luteus* (mud, clay), referring to the colour of the belly, which Main noted distinguished his new species from *C. rosea*: 'Belly pale fawn-brown with faint red-brown blotches...' (Main, 1963: 144). It is commonly said, erroneously, that the etymology is from Latin *luteus* (yellow, saffron), an unfortunate example of a Latin word having two meanings. This has even led to formal descriptions erroneously stating that the belly is yellowish (e.g. WAM, 2013), and to the erroneous English name Saffron Frog. A more apt name, which would be true to Main's original intention, would be Fawn-bellied Frog.

rosea (Harrison, 1927) (Karri or Roseate Frog) - Latin *roseus* (rose-coloured, ruddy): 'In life suffused all over with deep rose, which is easily visible on the lighter ventral surface.' (Harrison, 1927: 279).

victoriana (Boulenger, 1888) (Eastern Smooth Froglet) - From the type locality: 'Warragul, Gippsland, Victoria' (Boulenger, 1888: 143).

vitellina Wardell-Johnson & Roberts, 1989 (Orange-bellied Froglet) - Latin *vitellinus* (of the yolk of an egg), from the colour of the belly: '*G. rosea* has a red belly...and *G. vitellina* an egg-yolk colour' (Wardell-Johnson & Roberts, 1989: 17).

Heleioporus Gray, 1841 (m.) - *heleios* (marsh-dwelling) + *poros* (hole) presumably on account of some advice about the habitat and burrowing habit of the type species (*H. albopunctatus* Gray, 1841) given to John Gould, who would have provided the specimens to Gray. The original collection would have been made by John Gilbert (?1810-1845), Gould's chief collector in Australia, who was sent to Western Australia in 1839 and made detailed notes on the habits and habitat of all the animals he collected (Chisholm, 1941). An excellent account of Gilbert's collecting activities in Western Australia, although focusing on birds, can be found in Whittell (1941, 1951), particularly Whittell (1951) in which examples of Gilbert's detailed notes are given.

albopunctatus Gray, 1841 (Western Spotted Frog) - Latin *albus* (white) + *punctatus* (punctured, spotted), referring to the colouration: 'Lead coloured (in spirits), with white spots; beneath dirty white, with some small white warts at the angle of the mouth' (Gray, 1841b: 91).

australiacus (Shaw & Nodder, 1795) (Giant Burrowing Frog) - From the type locality, New Holland, i.e. Australia (Shaw & Nodder, 1795: pl. 200). Shaw (1802: 112) mischievously noted that Schneider (1799: 129, 139), who redescribed the species as *Rana spinipes*, had been 'so careful...to preserve it from oblivion, that he has twice described it in his own work within the compass of a few pages'. He also noted that Schneider was mistaken in supposing that the type was in the British Museum, since the original description was based on a figure etched from a drawing 'made in New Holland, its native country' (Shaw, loc. cit.).

barycragus Lee, 1967 (Western Marsh Frog) - *barys* (deep) + *kragon* (croaking), alluding to the call, which Lee described as a 'Low-pitched owl-like "hoot", slowly repeated.' (Lee, 1967: 395).

eyrei (Gray, 1845) (Moaning Frog) - After Edward John Eyre (1815-1901), who led several overland expeditions seeking new stock routes. In 1840-41 he led an exploring expedition from Adelaide to explore the interior to the north, but turned westward and crossed the Nullarbor Plain, eventually reaching Albany on King George Sound after great hardships, accompanied by Wylie, his Aboriginal companion. For this feat of endurance Eyre was awarded the gold medal of the Royal Geographical Society. From 1841 to 1844 he was resident magistrate at Moorundie, on the Murray River in New South Wales. During this time he began preparing the journals of his expedition for publication. In 1846 he was appointed lieutenant-governor of New Zealand, but resigned because of clashes with Governor Grey. In 1854 he was appointed lieutenant-governor of St Vincent in the West Indies, and in 1861 acting governor and then governor-in-chief of Jamaica. His controversial actions in putting down an insurrection led to his recall to England, where he was branded by his detractors 'the monster of Jamaica' (Dutton, 1966).

Gray described *Heleioporus eyrei* in an appendix to Eyre's account of the 1840-41 expedition from Adelaide to King George Sound (modern-day Albany) (Eyre, 1845), so that it is usually assumed that Eyre collected it at that time. Gray gave the type locality as the 'banks of the Murray River', and it is often assumed that this meant the Murray River of eastern Australia. However, the 1840-41 expedition did not pass that way, so if the collection is from there then it must have been when Eyre was droving sheep from Sydney to Adelaide in 1837 (although making natural history collections while droving sheep seems very doubtful), or during an exploration northward from Adelaide, returning down the Murray, in 1839, or between October 1841 and December 1844 when he was at Moorundie. A fundamental problem, however, is that the currently accepted distribution of the species is wholly in south-west Western Australia.

An alternative, suggested by Glauert (1947), is that Eyre collected the species on the

Murray River, south of Perth. Although Eyre did not reach this area during the 1840-41 expedition, as he returned directly to Adelaide from King George's Sound (Eyre, 1845), he did drove sheep overland from King George Sound to Swan River (Perth) in early 1840. However, as noted above, the likelihood of Eyre collecting natural history specimens while droving sheep seems remote. Furthermore, the overland route, opened by surveyor-general Roe (Roe, 1836), did not meet the Murray River at any point. (The modern-day Albany Highway follows this old route, passing about 30 km to the east of the easternmost reach of the Murray River, which is the confluence of the Hotham and Williams Rivers.)

inornatus (Lee & Main, 1954) - Latin *inornatus* (unadorned), in contrast with the otherwise similar *H. albopunctatus*: 'Differs in having no large white spots dorsally...' (Lee & Main, 1954: 158).

psammophilus (Lee & Main, 1954) (Sand Frog) - *psammos* (sand) + *philos* (loving), an allusion to the habitat: 'Confined to the fine sands and white sandy clays of the Darling Scarp and foothills.' (Lee & Main, 1954: 157).

Hylarana Tschudi, 1838 (f.) - A simple combination of genus *Hyla* and genus *Rana*, referring to Tschudi's view that the type species, *Hylarana erythrea* (Schlegel, 1837), belonged somewhere between these two genera (Tschudi, 1838: 37). *Rana* Linnaeus, 1758 is from Latin *rana* (frog), an ancient name. *Hyla* Laurenti, 1768 (m.) is from the vocative of Hylas, one of the mythical Argonauts, who was lured by water-nymphs to the edge of a pool and dragged into their realm forever. After Heracles and Polyphemos searched for him in vain, Heracles ordered the people of Mysia, a nearby town, to institute an annual festival dedicated to Hylas at the pool, directing them to call 'Hyla! Hyla! Hyla!' until, as Virgil said, '*littus "Hyla! Hyla!" omne sonaret*' -'the whole shore echoed "Hyla! Hyla!"' (Virgil, Eclogue 6, *The Song of Silenus*). Laurenti (1768: 33-34) gave a brief version of this story in explaining the name of the genus, concluding with '*Quam ob rem haec quasi Hylae sacerdos nomen ejusdem merita est.*' (Laurenti, 1768: 34). That is, the frog's call suggested to Laurenti the cries of the priest during the annual festival. Steineger (1907: 75) long ago clarified the etymology, and Copland (1962: 139) and Myers and Stothers (2006) reiterated it, but fanciful versions based on *hyle* (wood, forest) and even *hylao* (to bark like a dog) still abound. Myers and Stothers (2006) demonstrated that *Hyla* as treated by Laurenti must be considered feminine despite Hylas being male. However, because *rana* is feminine, *Hylarana* must in any case be treated as feminine under the Code (ICZN, 1999).

daemeli Steindachner, 1868 (Wood Frog or Water Frog) - After Edward Dämel (1821-1900), botanical and zoological collector in Australia and Oceania. He collected mainly invertebrates and vertebrates for the Godeffroy Museum in Hamburg (Musgrave, 1932). Although Steindachner did not mention him at all in the original description, there is no other person he could have meant. Steindachner (1868: 532) published the name as *Hylorana Daemeli* but referred to it as *H. Dämeli* in comparing it to other species. Steindachner (1868: 535) did not cite a holotype, but a series of nine specimens ('Wir untersuchten neun Exemplare von 1 3 - 2 5 Länge') that were treated as a syntypic series by Cogger *et al.* (1983). The name 'Wood Frog' is erroneous, as noted above, and 'Water Frog' is meaningless as it could be applied to any frog species. I therefore suggest that the name 'Dämel's Frog' should be applied to this species.

Lechriodus Boulenger, 1882 (m.) - *lechrios* (slanting, oblique) + Latinised suffix *-odes* (like, having the appearance of), no doubt alluding to the 'very oblique loreal region' of the head (Boulenger, 1882a: 439), although Boulenger did not state the etymology explicitly. The name is commonly said to mean 'slanting tooth', but that makes no anatomical sense. Boulenger originally named the genus

Batrachopsis, but this name was already in use: 'The name *Batrachopsis*, proposed by me for this genus, being preoccupied (Fitzinger, Syst. Rept.), is changed into *Lechriodus*.' (Boulenger, 1882b: 116).

fletcheri (Boulenger, 1890) (Fletcher's Frog) - 'I am indebted to Mr. J. J. Fletcher for a specimen of this interesting novelty, and for the opportunity of describing it.' (Boulenger, 1890: 594). Biologist and teacher Joseph James Fletcher (1850-1926) was born in New Zealand but migrated with his family to Australia in 1861. He was Secretary of the Linnean Society of New South Wales for 33 years (1885-1919) and became a leading authority on amphibians, but published on a wide variety of fauna and flora (Walsh, 1981).

Limnodynastes Fitzinger, 1843 (m.) - *limne* (lake, pond, marsh) + *dynastes* (ruler, prince), presumably merely a fanciful name. Fitzinger (1843: 31) cited *L. peronii* as the type but gave no hint about the etymology of the name of the genus. The original description of *L. peronii* (see under that name) sheds no light on the etymology.

convexiusculus (Macleay, 1877) (Marbled Frog) - Latin *convexiusculus* (somewhat convex), referring to the shape of the body: 'Head and back convex...' (Macleay, 1877: 136).

depressus Tyler, 1976 (Flat-headed Frog) - Latin *depressus* (flat, low, sunken), referring to the flattened head: 'It differs from *L. tasmaniensis* in having a particularly flattened head and large eyelids.' (Tyler, 1992: 56).

dorsalis (Gray, 1841) (Bullfrog, Western Banjo Frog) - Latin *dorsalis* (with a back or ridge), presumably drawing attention to the 'white streak down the middle of the forehead and front of the back' (Gray, 1841b: 91).

dumerilii Peters, 1863 (Eastern Banjo Frog) - Presumably after (André Marie) Constant Duméril (1774-1860), French doctor and zoologist in Paris, who made a considerable contribution to the understanding of Australian herpetology and ichthyology. He was professor of medicine at the University of Paris and also chair of herpetology and ichthyology at the Muséum national d'Histoire naturelle, Paris. Peters (1863: 235) did not indicate the etymology, so that it is possible that the name instead honours Constant's son Auguste (1812-1870), also a zoologist who worked extensively on amphibians, or perhaps both father and son. However, as Constant Dumeril had died only a few years before it seems more likely that the name honours him. (See also under *Pseudophryne bibronii*.)

fletcheri Boulenger, 1888 (Long-thumbed Frog, Marsh Frog) - After New Zealand-born Australian biologist J.J. Fletcher of Sydney, who presented the type specimen to the British Museum (Boulenger, 1888: 142). (See *Lechriodus fletcheri*.)

interioris Fry, 1913 (Giant Banjo Frog) - Latin *interior* (inner, inside), from the then only known localities of the species, all in the 'interior' of the continent rather than the western or eastern coastal regions: 'I have endeavoured to show here [in a map] to what extent these variations may be termed geographical, and have separated the Eastern and Riverina forms from the Western.' (Fry, 1913: 22-23). Fry created the name for a variety of *Limnodynastes dorsalis*, which he distinguished from the varieties *typica* ('western') and *dumerilii* ('eastern'). 'The type was collected at Merool Creek, Riverina, New South Wales, by Mr. James Ramsay. Two other specimens almost as large were collected by Mr. K. H. Bennett at Yandenbah, Riverina; a fourth, somewhat smaller specimen is unfortunately without data.' (Fry, 1913: 33).

lignarius Tyler, Martin & Davies, 1979 (Carpenter Frog, Woodworker Frog) - 'The specific name *lignarius* in Latin means 'carpenter', and is employed here because the mating call resembles the wooden note of a piece of timber being struck by a hammer.' (Tyler et al., 1979: 143).

peronii (Duméril & Bibron, 1841) (Brown-striped Frog) - After François Péron

(1775-1810), French explorer and naturalist: 'Nous possédons trois échantillons qui proviennent du voyage de Péron, mais nous ignorons le pays ou ils ont eté recueillis. Peut-être est-ce la Nouvelle-Hollande?' [We have three specimens that were collected during Péron's voyage, but we do not know the country where they were collected. Perhaps it is New Holland?] (Duméril & Bibron, 1841: 410). Duméril and Bibron were clearly uncertain about where the frog had been collected, but guessed correctly. Péron was appointed as naturalist and anthropologist on Nicholas Baudin's expedition to the South Seas, during which more than 100,000 zoological specimens were collected. The herpetological collection was sent to the Muséum de Paris, where Duméril and Bibron laboured to classify the collection. Péron wrote the first and most of the second volumes of the official history of the expedition (Péron, 1807; Péron & Freycinet, 1816), which was completed by Louis de Freycinet (Leslie & Reynolds, 1967).

salmini Steindachner, 1867 (Salmin's Striped Frog) - 'The contributions of Salmin were sufficiently significant for Steindachner (1867) to name *Limnodynastes salmini* in his honor.' (Tyler *et al.*, 1996). C.L. Salmin (d. 1876) was a dealer in natural history items in Hamburg (Schmeltz, 1878: 33). He is often credited as the collector of specimens on account of labels bearing his name, but there is no evidence that he was ever a collector. He seems to have been merely a dealer who did a brisk trade with a large number of museums in Europe and elsewhere. A reviewer noted that the type was likely to have been collected in 1866 by Edward Dämel (see under *Hylarana daemelii*), who probably sent his non-insect specimens to Salmin to deal with. By an odd coincidence the species is characterised by salmon-coloured stripes running longitudinally long the body (hence the alternative name Salmon-striped Frog), which has led to some confusion about the etymology.

tasmaniensis Günther, 1858 (Spotted Grass Frog) - From the collection locality of one of three specimens cited in the catalogue, 'Adult. Tasmania. Presented by R. Gunn, Esq.' (Günther, 1858: 33).

terraereginae Fry, 1915 (Northern Banjo Frog) - Latin *terrae* (of the land) + *reginae* (of the queen), i.e. from Queensland, alluding to the state from which the holotype was collected (Fry, 1915: 67). A reviewer noted that a well-known field guide gave the meaning as 'Lord of the Swamp -King of the Earth', apparently searching for something grandiose in the name rather than the mundane reality.

Litoria Tschudi, 1838 (f.) - Unfortunately Tschudi (1838: 36, 77) did not indicate the etymology, and the meaning is not immediately clear. It seems certain that the name is based on Greek, as are all of Tschudi's other generic names except those based on personal names. The only logical etymology then is from *litos* shore, coast + *oros* boundary, i.e. the edge of the sea (the equivalent of Latin *litoreus*). The type was collected by Louis Freycinet at Port Jackson, on the eastern Australian coast, so the idea of the name referring to the collecting locality seems perfectly reasonable. The only other sensible alternative seems to be Greek *litos* (plain, simple), which might refer to Tschudi's opinion of the appearance of the frog. However, extending *litos* to *litoros* in this regard is linguistically doubtful. An etymology based on *lithos* (rock), as sometimes suggested, seems very unlikely as it makes no sense in terms of linguistics or habitat.

adelaidensis (Gray, 1841) (Slender Tree Frog) - Adelaide (city in South Australia) + Latin *-ensis* (indicating the place of origin). The species is confined to the south-western corner of Western Australia, and Gray (1841b: 90) himself stated that the type was from Western Australia (Gray, 1841b: 90), so he seems to have merely made a geographical error in naming the species.

andiirrmalin McDonald, 1997 (Cape Melville Frog) - 'The specific name, *andiirrmalin*, is from the Barrow Point Aboriginal lan-

guage, Gumbiilmugu, for the frog (Roger Hart pers. comm., Aboriginal elder and cultural informant). Mr Hart explains that in local tradition the frogs are people who have been transformed as punishment for breaching certain rules. The species and habitat are believed to be culturally sensitive by Aboriginal people of the area.' (McDonald, 1997: 308).

aurea (Lesson, 1829) (Green and Golden Bell Frog) - Latin *aureus* (golden), alluding to the golden band on the body: 'Ce qui distingue cette belle espèce, est une bande d'or très-scintillante qui nait sur le rebord orbitaire, suit longitudinalement les côtés du corps, et s'arrête au point de départ des cuisses.' [What distinguishes this beautiful species is a very scintillating band of gold that arises on the orbital rim, following longitudinally the sides of the body, and stops at the junction of the thighs.] (Lesson, 1831: 61). Lesson called the species 'grenouille bande-d'or', the gold-striped frog. As a reviewer noted, the date for the publication of the species must be taken from the publication of the original illustration, two years earlier than the descriptive text cited here.

aurifera Anstis, Tyler, Roberts, Price & Doughty, 2010 - 'Derived from the latin *aureus* (gold) and *fero* (to carry or bear) alluding to the distinctive gold patches characterising the colour of the tadpole.' (Anstis *et al.*, 2010: 43).

axillaris Doughty, 2011 - *axillaris* (in the armpit): 'The Latin word *axillaris* refers to the area of the body where the lateral stripe continues in this species, compared to the termination of the stripe on the sides in *L. tornieri*.' (Doughty, 2011: 215). The lateral stripe in *L. axillaris* continues past the arm onto the flank, whereas in *L. tornieri* it ends just behind the mouth.

bicolor (Gray, 1842) (Northern Dwarf Tree Frog) - Latin *bicolor* (two-coloured), from the two-toned blue-white colour in spirits, as described by Gray (1842: 57). These colours were the result of leaching of yellow pigment from the naturally green and bronze skin after pickling in alcohol (probably rum). It is sometimes said that the name refers to the contrasting bronze and green pattern of the dorsal surface in the living animal, which is true only in a roundabout way, as Gray would never have seen a living specimen.

booroolongensis (Moore, 1961) (Booroolong Frog) - From the locality where the frog was first encountered, 'at Booroolong Creek, near Armidale, New South Wales' (Moore, 1961: 293). The holotype was not collected from this locality.

brevipalmata Tyler, Martin & Watson, 1972 (Green-thighed Frog) - Latin *brevis* (short, small) + *palmata* (bearing palms), i.e. having short palms, alluding to the short hind limbs, a character that distinguishes the species from other hylid frogs with small terminal discs (Tyler *et al.*, 1972: 84).

burrowsae (Scott, 1942) (Tasmanian Tree Frog) - After (Laura) Myrtle Burrows (1886-1966), a well-known Tasmanian mountaineer, who collected the type in Cradle Valley (Scott, 1942: 7). She was born in Launceston, daughter of Amelia and Alfred Burrows (Anon, 1937). Alfred Burrows was a well-known photographer in Tasmania. In an article in *The Mercury* (Anon, 1935) in which a photograph of her is included, she is described as 'well known in art circles in Launceston...a keen gardener, and a member of the Horticultural Society'. Shea (1988: 152) noted that Scott mistakenly gave a male termination to the specific epithet, and corrected the error.

caerulea (White, 1790) (Green Tree Frog) - Latin *caerulea* (blue), alluding to the overall colour of the preserved specimen: 'Blue frog, speckled beneath with greyish...' (White, 1790: 183). The blue colour was not natural; it was the result of leaching of yellow pigment in the outer (xanthophore) chromatophore layer after pickling in alcohol (probably rum), so that light scattered from the iridophore layer of the skin (and thus blue) no longer passed through the yellow filtering pigment.

castanea (Steindachner, 1867) (Yellow-spotted Tree Frog) - Latin *castanea* (chestnut), alluding to the colour of the upper body in the preserved state: 'Rücken glatt, kastanienbraun...' (Steindachner, 1867: 62), i.e. 'back smooth, chestnut-brown...'

cavernicola Tyler & Davies, 1979 (Cave-dwelling Tree Frog) - 'The specific name is derived from the Latin *caverna* (a hollow; cave or cavern) and *cola* (inhabitant).' (Tyler & Davies, 1979: 152), referring to the habitat.

chloris (Boulenger, 1893) (Red-eyed Tree Frog) - *chloros* (light green, yellow), from the colouration: 'Green above; upper arm and throat yellow...' (Boulenger, 1893: 403).

citropa (Tschudi, 1838) (Blue Mountains Tree Frog) - Latin *citrus* (lemon, citron) + Greek *poda* (combining form of *pous*, foot), from the colouration of the inside hind legs: 'Dans la Citripode [*Hyla citripoda* N.] toutes les articulations des cuisses postérieurs sont distinguées par une grande tache de couleur de citron.' [In the Citripode (*Hyla citripoda* new) all the joints of the hind legs are distinguished by a large lemon-coloured area.] (Péron, 1807: 407). Here Péron published the name, apparently validly, as *Hyla citropoda*. But as one reviewer noted, the publication of this name was overlooked until recently, and Tschudi (1838: 75) and Duméril and Bibron (1841: 600) repeated the epithet *citropa* that Péron had used (presumably in error) in an unpublished manuscript to which these authors often referred. Whether the epithet *citripoda* Péron should be considered a *nomen oblitum* - which one reviewer suggested would be welcomed by most frog taxonomists - is hard to argue against, considering the 175 years of use of *citropa*.

cooloolensis Liem, 1974 (Cooloola Tree Frog) - 'The specific name refers to the locality where the holotype was collected.' (Liem, 1974b: 173). This was 'Lake Coolamera, Cooloola, SE Queensland' (ibid: 169).

coplandi (Tyler, 1968) (Copland's Tree Frog) - 'After S. J. Copland, President of the Linnean Society of New South Wales, and an authority on *Hyla*' (Tyler, 1968: 216). Stephen John Copland (1907-1981) was born at Manly, Sydney, the eldest of five children. He attended Sydney University where he graduated BSc and then MSc with a thesis on the blood vascular system of *Varanus varius* (Copland, 1949). He was twice elected president of the Linnean Society of New South Wales (1952, 1956) and was a member of the honorary scientific staff at the Australian Museum until his death. A reviewer noted that Copland was employed as the night crime reporter for the *Sydney Morning Herald*, and did his research work as an amateur during the day.

cyclorhyncha (Boulenger, 1882) (Spotted-thighed Frog) - *kyklos* (circular, rounded) + *rhynchos* (nose, snout), referring to the distinctly rounded snout. Boulenger originally named the taxon as a subspecies of *Hyla aurea*.

dahlii (Boulenger, 1896) (Dahl's Aquatic Frog, Dahl's Frog) - 'The Snake and Frog which I propose to describe form part of a collection made by Dr. Dahl in North Australia, and submitted to me for identification by my friend Prof. Collett.' (Boulenger, 1896: 867). Norwegian zoologist Knut Dahl (1871-1951) arrived in Australia in 1894, and after travelling widely stayed for several months on Uniya Mission Station on the Daly River, from where he made expeditions to collect specimens for the University of Oslo (Dahl, 1926).

daviesae Mahony, Knowles, Foster & Donnellan, 2001 (Davies' Tree Frog) - 'Named in honour of Margaret Davies, Zoology Department, University of Adelaide for her substantial contribution to the advancement of herpetology in Australia and the systematics of Australian names.' (Mahony *et al.*, 2001: 45).

dayi (Günther, 1897) (Australian Lacelid, Day's Frog) - 'Mr. W. S. Day, who has collected in Australia and New Guinea for the Tring Museum for some years past, has sent to me a few reptiles which he obtained in the Bartle Frere Mountains.' (Günther, 1897: 403). W.S. Day was apparently a natural history collector

in Queensland in the 1890s, supplying specimens to various museums, including the Australian Museum. North (1904: 66) noted that Day had resided in the Bellenden Ker region for nine years and collected hundreds of bowerbirds -a 'feat' that stung Chisholm and Chaffer (1956: 13) to brand Day a 'light-fingered vandal'.

dentata (Keferstein, 1868) (Bleating Tree Frog) - Latin *dentata* (with teeth), referring to the unusual vomerine teeth: 'Vomerzähne hinter den Choanen in zwei halbkreis oder hufeisenförmigen, nach vorn offenen Gruppen, die mindestens so grossen Durchmesser als die Choanen haben...Schon durch die eigenthümlich gestellten Vomerzähne unterscheidet sich diese Art von allen sonst bekannten...' [Vomerine teeth behind the choana in two semicircular or horseshoe-shaped, forward-opening groups, with diameters at least as large as the choana...By the oddly shaped teeth arrangement this species differs from all others known...] (Keferstein, 1868: 284).

electrica Ingram & Corben, 1990 (Buzzing Tree Frog, Electric Tree Frog) - English *electric*, from the peculiar call: 'The call of *L. electrica* has a wavering quality that suggests the sound of a high voltage, long duration, electric arc. This appears to be due to irregular variations in amplitude between pulses of a call.' (Ingram & Corben, 1990: 478). The word *electric* is derived from Greek *elektron* (amber), referring to the electrostatic discharge that occurs when two amber rods are rubbed together.

eucnemis (Lönnberg, 1900) (Fringed Tree Frog, Growling Tree Frog) - *eu* (well, good) + *knemis* (greave, legging), an allusion to the 'well-developed denticulated fringe along the outer side of the forearm and the outer finger' (Lönnberg, 1900: 580).

ewingii (Duméril & Bibron, 1841) (Brown Tree Frog) - 'Cette espéce se trouve à la terre de Van Diemen. Nous en possédons un échantillon qui nous a eté donné par la société zoologique de Londres, dans le Museé de laquelle il y a plusieurs autres qui proviennent d'un don fait par M. Ewing.' [This species is found in Van Dieman's Land. We have a specimen that was given to us by the Zoological Society of London, in the Museum of which there are many collected by Mr Ewing.] (Duméril & Bibron, 1841: 598). This was no doubt English-born clergyman and teacher Thomas James Ewing (1813-1882), who was a keen naturalist in Tasmania and wrote a number of papers on birds (Hagger, 1966).

fallax (Peters, 1880) (Eastern Dwarf Tree Frog) - Latin *fallax* (deceptive), presumably from the similarity to other species: '... *supra caerulea vel caeruleogrisea, concolor vel nigromaculata...*' [...close to *caerulea* or *caeruleogrisea*, *concolor* or *nigromaculata* ...] (Peters, 1880: 224).

freycineti Tschudi, 1838 (Freycinet's Frog) - After French explorer Louis-Claude Desaules de Freycinet (1779-1842), who provided to the Paris Museum the specimen described by Tschudi: 'Freycinet brachte diese Hyla aus Neuholland mit...' (Tschudi, 1838: 36). Freycinet was principally a cartographer and surveyor on the French expedition of 1800-1804 (in *Le Géographe* and *Le Naturaliste*, and later the *Casuarina*) that explored much of the Australian coast, and during which the type specimen was collected. He later commanded *l'Uranie* on its voyage of scientific discovery, during which he spent a long period on the western coast of Australia.

genimaculata (Horst, 1883) (New Guinea Tree Frog) - Latin *geno* (to bear) + *maculatus* (spotted), i.e. 'bearing spots', referring to the 'dark dots along the border of the mouth' (Horst, 1883: 240). The type was collected on Gebeh Island in the Maluku Islands (Moluccas).

gilleni (Spencer, 1896) (Centralian Tree Frog) - After ethnologist Francis James Gillen (1855-1912) of Alice Springs, who met Baldwin Spencer at the end of the Horn Expedition to Central Australia in 1894. Gillen contributed to the two-volume report of the results of the expedition and later formed a

working relationship with Spencer, culminating in 1899 in the publication of *Native Tribes of Central Australia* (Mulvaney, 1983).

gracilenta (Peters, 1869) (Dainty Green Tree Frog) - Latin *gracilenta* (slender), no doubt alluding to the slender body of the frog, although Peters (1869: 790) did not say as much.

inermis (Peters, 1867) (Peters' Frog) - Latin *inermis* (unarmed, toothless), presumably alluding to the small vomerine teeth: 'Vomerzähne bilden zwei kleine Haufen...' [Vomerine teeth forming two small lumps...] (Peters, 1867: 30).

infrafrenata (Günther, 1867) (Giant Tree Frog, Growling Tree Frog, White-lipped Tree Frog) - Latin *infra* (below, under) + *frenatus* (bridled), alluding to the 'pure white band round the margin of the *lower* jaw, and continued in a straight line to below and behind the tympanum' (Günther, 1867: 56).

jervisiensis (Duméril & Bibron, 1841) (Jervis Bay Tree Frog) - From Jervis Bay, the locality where the original specimen was collected by Péron and Lesueur: 'Ce Batracien provient du voyage de Péron et de Lesueur aux terres australes. La baie de Jervis est le lieu de la Nouvelle-Hollande où il a été recueilli par ces zélés naturalistes.' (Duméril & Bibron, 1841: 581).

jungguy Donnellan & Mahony, 2004 (Jungguy Tree Frog) - 'The specific epithet *jungguy* is likely to be the name used for this species in the Mamu and Jirrbal dialects of the Dyirbal language. Mamu was spoken around the South Johnstone River as far south as Millaa Millaa and Jirrbal was spoken from Herberton south almost to the Murray River (R. M. W. Dixon, personal communication).' (Donnellan & Mahony, 2004: 23).

kroombitensis Hoskin, Hines, Meyer, Clarke & Cunningham, 2013 (Kroombit Tree Frog) - from the locality of the type collection: 'Referring to the restriction of this species to Kroombit Tops, with the - *ensis* extension being latin for 'belonging to'. The epithet is to be treated as a noun in apposition.' (Hoskin *et al.*, 2013: 431). I do not believe that the Code (ICZN, 1999) allows an epithet that is unambiguously adjectival to be considered a noun in apposition, even if the authors so declare it. But in any case it is a moot point because the epithet would be the same no matter whatever the gender of the genus.

latopalmata Günther, 1867 (Broad-palmed Frog, Günther's Frog) - Latin *late* (broad) + *palma* (palm) + *-ata* (with), i.e. 'with broad palm', referring to the wide webbing of the toes: 'Toes broadly webbed, the web extending to the disks of the third and fifth toes.' (Günther, 1867: 55). The name is sometimes mistakenly said to mean 'side-handed'.

lesueuri (Duméril & Bibron, 1841) (Lesueur's Frog) - After French naturalist and artist Charles-Alexandre Lesueur (1778-1846) who, with Péron, collected one of the original specimens on the Baudin expedition of 1800-1804: '...l'un a eté rapporté par Péron et Lesueur, l'autre par MM. Quoy et Gaimard.' [...one had been reported by Péron and Lesueur, the other by Misters Quoy and Gaimard.] (Duméril & Bibron, 1841: 597). The same name had been given to another species by Bory de Saint-Vincent in 1828, but that name is treated as a *nomen oblitum* (Shea, 2001: 339).

littlejohni White, Whitford & Mahony, 1994 (Littlejohn's Frog, Littlejohn's Tree Frog) - 'The species is named for Dr Murray Littlejohn, of the University of Melbourne, in recognition of his outstanding contributions to anuran biology.' (White *et al.*, 1994: 6). Professor Murray Littlejohn is held in high esteem for his contribution to Australian herpetology, particularly his recordings of frog calls that have been so useful for professionals and amateurs alike. (See also *Crinia sloanei*.)

longirostris Tyler & Davies, 1977 (Long-snouted Frog) - '(*Latin.*)-Longus (long) and rostum [sic] (nose) in reference to prominent snout...' (Tyler & Davies, 1977: 622).

lorica Davies & McDonald, 1979

(Armoured Frog) - 'The specific name is derived from the Latin *lorica* "breast plate", in reference to the accessory pectoral spines on the male.' (Davies & McDonald, 1979: 171).

meiriana (Tyler, 1969) (Rockhole Frog) - Aboriginal *meiri* (waterhole) + *-ana* (belonging to), alluding to the habitat: 'An adult collected at a rock pool 98 miles north of Mainoru, Northern Territory...The type locality is an aboriginal wind-dreaming site...in an area where the annual rainfall is approximately 50-60 inches.' (Tyler, 1969: 2, 6). Baldwin Spencer (1914: 460) noted the use of the word *meiri* by the 'Kakadu tribes'.

microbelos (Cogger, 1966) (Javelin Frog) - *mikros* (small) + *belos* (javelin). 'The subspecific name alludes to the acute, javelin-like appearance of this diminutive frog.' (Cogger, 1966: 225). Cogger named the taxon as a subspecies of *Litoria dorsalis* Macleay, a New Guinean species, describing it as 'very slender...Snout rather acutely pointed, projecting well in front of lower jaw'.

moorei (Copland, 1957) (Moore's Frog, Motorbike Frog, Western Green and Golden Bell Frog) - 'It was decided to name the species for Professor John A. Moore, Department of Zoology of Barnard College and Columbia University, New York, whose stay as a Fulbright Research Scholar at the University of Sydney did so much to stimulate interest in Australian frogs.' (Copland, 1957: 84). Moore's monograph on the frogs of south-eastern Australia (Moore, 1961) was a seminal publication in 20th century Australian zoology.

myola Hoskin, 2007 (Kuranda Tree Frog) - 'The specific epithet is in recognition of Myola, a locality where this species occurs. This name is believed to be of aboriginal origin, although the language and dialect are not recorded...The common name 'Kuranda tree frog' refers to the township around which the distribution is centred.' (Hoskin, 2007: 556). The town of Myola takes its name from the railway siding on the Cairns-Kuranda railway, built in the 1890s. The Aboriginal etymology of the name 'Myola' is uncertain, as there are other places with the name in Queensland, New South Wales and Victoria, and indeed in other parts of the world (e.g. Fiji, USA). It was one of the potential names for the city that is now Canberra, as it was thought then to be an Aboriginal word for 'meeting place', but without any evidence.

nannotis (Andersson, 1916) (Torrent Tree Frog) - *nannos* = *nanos* (tiny) + *otis* (ear), referring to the markedly small tympanum: 'Tympanum very small, about the fourth the diameter of the orbit, its upper margin not distinct.' and 'By the very small tympanum this species seems to be aligned to *Hyla arfakiana* PETERS & DORIA and possibly to *Hyla parvidens* PETERS.' (Andersson, 1916: 16).

nasuta (Gray, 1842) (Rocket Frog) - Latin *nasutus* (having a large nose), from the elongated snout: '*Pelodytes nasutus*. Nose rather produced, conical.' (Gray, 1842: 56).

nigrofrenata (Günther, 1867) (Bridle Frog) - Latin *niger* (black) + *frenata* (bridled): 'a broad black band runs from the extremity of the snout through the eye and tympanum, to the side of the abdomen, being *interrupted a short distance behind the tympanum*...' (Günther, 1867: 57).

nudidigitus (Copland, 1962) (Leaf Green River Tree Frog) - Latin *nudus* (naked) + *digitus* (finger) - 'Differs from the nominate race by the absence or, at the very most a scarcely discernible rudiment of, web between the fingers...' (Copland, 1962: 137). Although the feminine form *nudidigita* is commonly used, the epithet should be treated as a compound noun in apposition and thus unalterable from Copland's original *nudidigitus* under the Code (ICZN, 1999: Articles 31.2.1 and 34.2.1).

nyakalensis Liem, 1974 (Nyakala Frog) - 'The specific name refers to Nyakali, an aboriginal tribal group who once lived in the vicinity of the type locality.' (Liem, 1974a: 160). Nyakali, or Nyagali, is a dialect of Djabugay spoken in the Port Douglas area (Patz, 1991: 246), some distance from the

type locality (Henrietta Creek, close to the Palmerston Highway). The type locality is in the country of the Mamu (Dyirbal) people (either the Waribarra Mamu or Dulgubarra Mamu language group) (AIATSIS, 2013b).

olongburensis Liem & Ingram, 1977 (Olongbura Frog) - 'The specific name refers to the aboriginal tribe, Olongbura, who once lived in the Northern half of Fraser Island.' (Liem & Ingram, 1977: 262). Because of the place termination -ensis, the authors presumably intended the name to mean 'belonging to the place of the Olongbura'; otherwise the epithet would have to be considered an orthographic error. Tindale (1974; cited in SAM, 2013) called the people of northern Fraser Island Ngulungbara, noting the alternative names Olungbura, Gnoolongbara and Koolaburra. The people of Fraser Island are recognised today as the Butchulla or Batjala (AIATSIS, 2013c).

pallida Davies, Martin & Watson, 1983 (Pale Frog) - 'The specific name is derived from the Latin *pallidus* meaning pale, ashen, in reference to the predominant colour of the dorsum.' (Davies *et al.*, 1983: 103).

paraewingi Watson, Loftus-Hills & Littlejohn, 1971 (Victorian Frog) - *para* (beside) + species *ewingi*, alluding to the great morphological similarity of the two species: 'Populations of the *L. ewingi* complex in central and southern Victoria are described as a new species (*L. paraewingi*) following a study of reproductive isolation and morphological differentiation from other members of the complex.' (Watson *et al.*, 1971: 401).

pearsoniana (Copland, 1961) (Pearson's Frog, Pearson's Green Tree Frog) - After the collector of the holotype: 'Thanks to the courtesy of Dr. J. C. Pearson, Lecturer in Helminthology in the University of Queensland, I have received three specimens of a tree-frog which appears to be new, and which I accordingly describe as *Hyla pearsonii*, sp. nov.' (Copland, 1960: 154). Because this original name was preoccupied, Copland later published the replacement name (Copland, 1961: 168). Canadian-born parasitologist John Cawardine Pearson (b. 1927) came to the University of Queensland as a post-doctoral Fellow, beginning a life-long career as an internationally renowned parasitologist, specialising in trematodes. His work included studies on the parasites of frogs and their potential to infest humans. In recognition of his standing in his field, he was awarded a Personal Chair in Helminthology at the university in 1986 (Angus *et al.*, 2007: 17-18, 79-83).

peronii (Tschudi, 1838) (Peron's Tree Frog) - After François Péron (1775-1810), French explorer and naturalist (see under *Limnodynastes peronii*), who collected the type: 'Dendrohyas Peroni Mus. Par., von Peron aus Neu-Holland mitgebracht...' [Dendrohyas Peroni Mus. Par., brought from New Holland by Péron...] Tschudi (1838: 33-34).

personata Tyler, Davies & Martin, 1978 (Masked Frog, Masked Rock Frog) - 'The specific name is derived from the Latin, *personatus*, masked, in reference to the dark stripe through the eye.' (Tyler *et al.*, 1978: 153).

phyllochroa (Günther, 1863) (Leaf-green Tree Frog) - *phyllon* (leaf) + *chroa* (colour of the skin, complexion), from the distinctive green colouration: 'This species...is generally of a uniform light sap-green, which, under certain circumstances, becomes darker.' (Günther, 1863b: 251).

piperata Tyler & Davies, 1985 (Peppered Frog, Peppered Tree Frog) - 'From the Latin "*piper*" meaning peppered, referring to the characteristic patterning on the dorsum.' (Tyler & Davies, 1985: 148).

raniformis (Keferstein, 1867) (Southern Bell Frog) - Latin *rana* (frog) + Latin *formis* (shaped), presumably alluding to the overall resemblance to species in the genus *Rana*, although Keferstein (1867: 358) gave no clue to the etymology.

revelata Ingram, Corben & Hosmer, 1982 (Revealed Frog) - Latin *revelata* (unveiled, uncovered), an allusion to the fact

that the frog had been known for some time before it was described, on account of various taxonomic difficulties (Ingram *et al.*, 1982: 635).

rheocolus Liem, 1974 (Creek Frog) - 'The specific name is derived from the Greek rheos meaning creek or stream, and the latin suffix, *colus* meaning an inhabitant; it refers to the habitat of the frog.' (Liem, 1974a: 156). In classical Latin, compounds with the suffix *-cola* are masculine or common nouns of the 1st declension (Nicholson 1987: 742) and should not be declined as if they were of the 2nd declension. The supposedly masculine and neuter suffixes *-colus* and *-colum* do not exist in classical Latin and should not be used to form names. In any case the masculine termination *-us* should not have been applied because *Litoria* is clearly not a masculine name.

rothii (De Vis, 1884) (Roth's Tree Frog) - 'Four specimens collected at Mackay by Mr. H. Ling Roth.' (De Vis, 1884: 67). Henry Ling Roth (1855-1925) was a naturalist and ethnologist who arrived in Mackay in 1878 to investigate the prospects for the sugar cane industry for a group of English businessmen (Griffin, 1988). He remained there as private secretary to J.B. Lawes on Fairleigh Station (Hulme & McDougall, 2007: 44) until 1884, when he returned to England. In 1890 he became curator of the Bankfield Museum in Halifax, Yorkshire, and later wrote books on many historical and ethnological subjects, including the Aborigines of Tasmania and the settlement of Mackay (Roth, 1890, 1906), almost wholly from second-hand information. For a thought-provoking discussion of Roth's ethnography, see Hulme and McDougall (2007).

rubella (Gray, 1842) (Desert Tree Frog, Red Tree Frog) - Diminutive of Latin *ruber* (red, ruddy), alluding to the overall colour: 'Reddish grey, in spirits.' (Gray, 1842: 56).

serrata Andersson, 1916 (Green-eyed Tree Frog) - Latin *serratus* (toothed), alluding to a feature of the limbs: 'The very distinct serrated dermal folds along the fore-arm and hand, and tarsus and foot give the same characteristic appearance to that species [*Hyla rhacophorus*] as to the one described here.' (Andersson, 1916: 18).

spenceri Dubois, 1984 (Spotted Tree Frog) - After Walter Baldwin Spencer, who in 1901 described the species as *Hyla maculata*, a name unfortunately pre-occupied by *Hyla maculata* Gray, 1830 and therefore unavailable. In transferring the species to *Litoria*, Alain Dubois (1984: 83) followed the common practice of forming a new epithet from the surname of the original author. See under *Limnodynastes spenceri* for a note about Spencer.

splendida Tyler, Davies & Martin, 1977 (Magnificent Tree Frog) - Latin *splendida* (magnificent, showy, grand) from the relative size and appearance of the species: '...a large and spectacular creature...' (Tyler *et al.*, 1977: 138).

staccato Doughty & Anstis, 2007 (Chattering Rock Frog) - 'Specific name *staccato* is from the Italian musical term, and refers to the short detached sound of the individual repeated notes of the male advertisement call.' (Doughty & Anstis, 2007: 253).

subglandulosa Tyler & Anstis, 1983 (Glandular Frog) - A simple replacement name for *Litoria glandulosa* Tyler & Anstis, 1975, a junior primary homonym of *L. glandulosa* Bell, 1843: 'In accordance with the provisions of the International Code of Zoological Nomenclature, the Australian species requires a replacement name. Accordingly we propose *Litoria subglandulosa* for it.' (Tyler & Anstis 1983: 130). The name *glandulosa* refers to the 'possession of a very large submandibular dermal gland', one of the characters that distinguishes the species from all *Litoria* species except *L. citropa* (Tyler & Anstis, 1975: 49).

tornieri (Nieden, 1923) (Tornier's Frog) - After Gustav Tornier (1859-1938), German zoologist and palaeontologist at the Museum für Naturkunde in Berlin. According to

Beolens *et al.* (2011: 266) he is remembered mainly for incorrectly reconstructing the skeleton of the dinosaur *Diplodocus* to give it a crawling instead of upright gait. Fritz Nieden (1883-1942) was a colleague of Tornier at the Museum. In transferring *Pelodytes affinis* Gray, 1842 to *Hyla* he recognised that a new specific epithet was required, since *Hyla affinis* was preoccupied by *Hyla affinis* Spix, 1824 (Nieden, 1923: 228). Although *Hyla grayi* could have been used, Nieden (perhaps because Tornier retired in 1923) chose to honour his colleague instead.

tyleri Martin, Watson, Gartside, Littlejohn & Loftus-Hills, 1979 (Tyler's Tree Frog) - 'The species is named for Michael J. Tyler of the University of Adelaide, in recognition of his contributions to our knowledge of Australo-Papuan hylid frogs.' (Martin *et al.*, 1979: 34). Associate Professor Michael Tyler's contributions to the knowledge of Australian herpetology are legendary, spanning 55 years and including more than 350 papers and 20 books. He was on the staff of The University of Adelaide from 1971 to 2001, and is currently a visiting research fellow there. He has also had a long assocation with the South Australian Museum, the Royal Society of South Australia, The Royal Zoological Society of South Australia and the Australian Institute of Biology. He is the recipient of numerous awards and distinctions, including Officer of the Order of Australia for contributions to zoology.

verreauxii (Duméril, 1853) (Verreaux's Frog) - After botanist, zoologist and natural history collector Jules Pierre Verreaux (1807-1873), who obtained specimens in Australia from 1842 to 1851 for his family's business, selling items of natural history. 'L'examen:.. que d'une série de *R. de Ewing* également rapportée de l'Australie par M. J. Verreaux..:.' (Duméril, 1853: 172). The following biographical information is drawn largely from Molina (2002). Maison Verreaux was a major taxidermy and natural history supplier to European museums in the early to mid 19th century. Jules Verreaux made his first collecting trip in 1818 when he was only 11 years old, travelling with his uncle, Pierre Delalande, to the Cape of Good Hope and remaining there until 1820 (Molina, 2002). From 1842 to 1851 he travelled around Australia and the western Pacific, collecting around 115 000 specimens (ANH, 2014). In 1864 he was appointed assistant naturalist at the Muséum d'Histoire Naturelle in Paris. Together with his brother Edouard, his total contribution to the family enterprise probably numbered over 400,000 specimens covering every plant and animal group known. While famous for his vast collections and commemorated in the names of a number of species, Verreaux is equally infamous for his role in the saga of 'El Negro', a Khoesan man stolen from his grave by the brothers the day after his death (along with dozens of whole skeletons from other graves), stuffed and mounted, and put on display in Paris (Molina, 2002).

watjulumensis (Copland, 1957) (Wotjulum Frog) - After Watjulum (subsequently changed to Wotjulum) Mission in Western Australia, from where five type specimens were collected: 'The type locality Watjulum Mission is close to Yampi Sound, north of King Sound.' (Copland, 1957: 96).

wilcoxii Günther, 1864 (Wilcox's Frog) - 'Two specimens...were collected at the Clarence River by James F. Wilcox Esq., to whom science is indebted for many valuable acquisitions from that country.' (Günther, 1864: 49).

xanthomera Davies, McDonald & Adams, 1986 (Orange-thighed Frog) - 'The specific name is derived from *xanthos* (Gk), "orange" and *meros*, "thigh" in reference to the colour of the thighs of this species.' (Davies *et al.*, 1986b: 71).

Metacrinia H.W. Parker, 1940 (f.) - *meta* (among, between, before, after) + genus *Crinia*, presumably an allusion to the similarity of the type species, *Pseudophryne nichollsi* Harrison, 1927, to that genus, although Parker (1940: 93-94) did not state the ety-

mology. One of his original spellings, *Metracrinia*, was a typographical error, as shown by his correct spelling of *Metacrinia* on the same page (Parker, 1940: 93) and elsewhere in the work.

nicholisi (Harrison, 1927) (Nicholl's Toadlet) - '...four young and two half-grown collected at Deep River, Nornalup, on the south coast by Professor G. E. Nicholls, 30.xi.1925.' (Harrison, 1927: 284). The following biographical information is drawn from Waring (1953) and Frankel (2012). English-born George Edward Nicholls (1878-1953) was Professor of Biology at the University of Western Australia from 1921 to 1947. After graduating with a BSc in zoology from King's College, London, he taught at the University of Allahabad in India, before returning to King's College in 1914. By then he was a Fellow of the Linnean Society of London, serving as a member of council from 1916 to 1919. He was awarded a DSc from the College in 1924. His interest in the origins of the Western Australian fauna led him to become a leading proponent, along with Professor Launcelot Harrison of the University of Sydney, of the theory of mobilism (continental drift), rather than the prevailing theory of land bridges, to explain biogeographical patterns.

Mixophyes Günther, 1864 (m.) - *mixos* (mixed, confused) + *phyes* (growth, stature), alluding to Günther's view of the odd body form: 'This Batrachian approaches the true Frogs more closely than any other known from the Australian region; its habitus is that of *Rana*, but the head is disproportionally large and broad. The snout is obtusely rounded, with the canthus rostralis gradually descending in a gentle curve, and with the loreal region obliquely flattened. The nostril is scarcely below the canthus, midway between the eye and the end of the snout.' (Günther, 1864: 46). The etymology is often mistakenly said to be from *myxes* (slimy), which has led to unfortunate and oft-repeated name 'slimy-frog' for members of the genus. The more appropriate name 'barred frogs' is usually used, alluding to the pattern of stripes across the limbs. Günther treated the name as masculine, as demonstrated by the specific epithet of the type species, *M. fasciolatus*.

balbus Straughan, 1968 (Stuttering Frog) - Latin *balbus* (stammering, stuttering), from the stuttering call. Straughan knew the call because he (with A.R. Main) collected the holotype in New England National Park (Straughan, 1968: 55).

carbinensis Mahony, Donnellan, Richards & McDonald 2006 (Carbine Barred Frog) - 'Specific epithet alludes to the Carbine Tableland, an upland area at the southern end of the range of the species.' (Mahony *et al.*, 2006: 53). The holotype was collected on Mount Lewis on the Carbine Tableland, a locality well known to taxonomists for its remarkable faunal and floral diversity.

coggeri Mahony, Donnellan, Richards & McDonald 2006 (Cogger's Barred Frog, Cogger's Frog) - 'Named for Professor Harold George Cogger, former deputy director of the Australian Museum, for his sustained, significant, and wide-ranging contributions to herpetology on a global scale.' (Mahony *et al.*, 2006: 57). Hal Cogger was curator of reptiles and amphibians at the Australian Museum, Sydney, from 1960 to 1975, and Deputy Director of the museum from 1976 to 1995. He is now John Evans Memorial Fellow at the museum. Cogger is one of the best-known herpetologists in Australia, having written a vast number of papers and books on the herpetofauna of Australia, New Guinea and the western Pacific. He has been actively involved in threatened species conservation for several decades.

fasciolatus Günther, 1864 (Great Barred Frog) - Latin *fasciolatus* (having a small band or stripe), referring to the garter-like bands on the legs: '...legs with numerous cross bands, which are most distinct on the hinder side of the fore legs and on the anterior side of the hind limbs.' (Günther, 1864: 46).

fleayi Corben & Ingram, 1987 (Fleay's Barred Frog, Fleay's Frog) - 'The species is named for the Australian naturalist, David Fleay.' (Corben & Ingram, 1987: 235). Zool-

ogist David Howell Fleay (1907-1983) was educated in Victoria, obtaining a B.Sc. and Dip.Ed. from the University of Melbourne in 1931 (Anderson, 1999). After teaching in Ballarat and working at the Melbourne Zoo, where he had several notable successes breeding native animals, he was appointed director of the Sir Colin Mackenzie Sanctuary in Healesville, where he bred the first platypus in captivity. In 1952 he established a zoological sanctuary at Burleigh on the Gold Coast, now owned by the Queensland Government and known as the David Fleay Conservation Park. He was made a Member of the Most Excellent Order of the British Empire (MBE) in 1960 and a Member of the Order of Australia in 1980.

iteratus Straughan, 1968 (Giant Barred or Southern Barred Frog) - Latin *iteratus* (repetitive), an allusion to the repetitive, grunt-like call. Straughan did not state the etymology explicitly, but noted that each of the species he described had a distinctive call (Straughan, 1968: 60).

schevilli Loveridge, 1933 (Northern Barred Frog) - 'collected in April, 1932, by Mr. W. E. Schevill, after whom the race is named' (Loveridge, 1933a: 56). Loveridge originally described the species as a subspecies of *M. fasciolatus*, and Straughan (1968: 57) raised it to species rank. William Edward Schevill (1906-1994) was a renowned American zoologist, most famous for his pioneering studies of cetacean communication. As a young student, he was a member of the Harvard Australian Expedition to Australia in 1931-32, when he collected the type (Rolfe, 2012: 162).

Myobatrachus Schlegel, 1850 (m.) - No doubt from *myon* (knot of muscles) + *batrachos* (frog), referring to the peculiar appearance of the frog, which resembles a miniature sumo wrestler. Unfortunately there is nothing to indicate the etymology in the original description of the genus, which was an extract from a letter from Schlegel to John Gray (Schlegel, 1850: 9).

gouldii (Gray, 1841) (Gould's Froglet) - After English naturalist John Gould (1804-1881): 'Mr. Gould having kindly placed in my hands the collection of Reptiles which he made during his visit to New Holland...' (Gray, 1841b: 86). Gould travelled to Australia with his family in 1838 on a vast collecting expedition, but did not himself visit Western Australia (Chisholm, 1966b). The type must therefore have been collected by his chief collector in Australia, John Gilbert (see under *Heleioporus*). Gould's *Birds of Australia* (Gould, 1840-1848), illustrated in part by his artist wife Elizabeth (1804-1841), remains a classic zoological text.

Neobatrachus Peters, 1863 (m.) - *neo* (new) + *batrachos* (frog); the etymology is obvious, although Peters (1863: 234-235) did not state it.

albipes Roberts, Mahony, Kendrick & Majors 1991 (White-footed Frog) - Latin *albus* (white) + *pes* (foot): 'Distinguished in life from *N. pelobatoides* by presence of white pigment in skin on upper surface of foot.' (Roberts *et al.*, 1991: 28).

aquilonius Tyler, Davies & Martin, 1981 (Northern Burrowing Frog) - 'From the Latin *aquilonius* meaning 'northern'. This species is the most northern member of *Neobatrachus* yet described.' (Tyler *et al.*, 1981c: 159).

fulvus Mahony & Roberts, 1986 (Tawny Frog) - 'From Latin *fulvus* meaning 'reddish yellow or tawny', thus describing the colour of this species.' (Mahony & Roberts, 1986: 163).

kunapalari Mahony & Roberts, 1986 (Kunapalari Frog) - 'The name applied to this species by Aborigines of the Gugadja tribe (Peile, 1978).' (Mahony & Roberts, 1986: 168). Father Anthony Peile (1931-1989) spent 16 years studying the language and environment of the Kukatja (= Gugadja) people of the Tanami Desert, around Lake Gregory and Wirrumanu (Balgo) (AIATSIS, 2013a), far from the nearest records of the Kunapalari Frog. It therefore seems possible that the Kukatja word referred to *N. aquilonius*, the only species of burrowing frog in

their country. The type of *N. kunapalari* was collected from the vicinity of Merredin, east of Perth, in Noongar country.

pelobatoides (Werner, 1914) (Humming Frog) - Genus *Pelobates* + *-oides* (resembling), a simple reference to the similarity in appearance to the northern hemisphere spadefoot toads of genus Pelobates that would have been very familiar to Werner (Werner, 1914: 418), as a reviewer noted. The name *Pelobates* Wagler, 1830 is from (*pelos* (swamp, marsh) + participle of *baino* (to walk, settle), probably in the sense of swamp-dwelling: 'Nomen ranae, a πηλος palus, et βαινω eo.' (Wagler, 1830: 206). Greek *bateo* is an alternative form of *baino* used specifically in relation to animals.

pictus Peters, 1863 (Painted Frog) - Latin *pictus* (painted, dyed, stained), alluding to the colouration: 'Schwarz oder schwarzbraun mit einer weissen Linie längs dem Rücken und schwarz und weiss marmorirt an den Körperseiten, auf dem Vorderarm und der hinteren Extremität.' [Black or black-brown with a white line along the back, and black and white marbling on the sides of the body, the forearm and hind leg.] (Peters, 1863: 235).

sudellae (Lamb, 1911) (Sudell's Frog) - 'Named for Miss J. Sudell, its collector.' (Lamb, 1911: 26). Jane Ann Sudell (b. 1880) was Joseph Lamb's younger half-sister (Shea, 2013: 116). The type was collected at Warwick, Queensland. Lamb originally named the species *N. sudelli*, but Shea emended the name to give it a female termination as required by the International Code for Zoological Nomenclature (Article 31.1.2). Jane Sudell was the daughter of Henry Sudell and Emma Lamb (née Harrison). She married in 1910 and in 1925 was still living in Warwick.

sutor Main, 1957 (Shoemaker Frog) - Latin *sutor* (shoemaker): 'Because of the call this frog has been known by children in the north-eastern Wheatbelt as "The Shoemaker Frog" (Miss J. Arnold pers. comm.) whence the specific name.' (Main, 1957b: 24). Main described the call as a 'short repetitive tapping'.

wilsmorei (H.W. Parker, 1940) (Goldfields Bullfrog) - Although Parker (1940) did not give the etymology, the name no doubt honours Norman Thomas Wilsmore (1868-1940), who had been Dean of Science and was later Vice-Chancellor of the University of Western Australia. The type was collected by Nicholls (see under *Metacrinia nichollsi)*.

Notaden Günther, 1873 (m.) - *notos* (the back) + *aden* (gland): 'Not only the parotoid region, but that of the entire back is thickened by numerous glands.' (Günther, 1873: 349-350). Greek aden is a masculine noun of the third declension.

bennetti Günther, 1873 (Crucifix Frog, Holy Cross Frog) - 'I have named this form after Dr. G. Bennett, to whom we are indebted for many species of the greatest interest.' (Günther, 1873: 350). English-born George Bennett (1804-1893) was a medical doctor and naturalist. He visited Australia in 1829, and again in 1832 when he spent much time travelling and collecting. On returning to England he published an account of his experiences in Australia (Bennett, 1834). In 1836 he returned to Australia and lived the rest of his life in Sydney, where he established a medical practice but was also active with the Australian Museum and the Zoological Society (Chisholm, 1966a). A complete biography of Bennett (Hickie, 2013) has recently been published.

melanoscaphus Hosmer, 1962 (Northern Spadefoot Toad) - *melanos* (black) + *skaphos* (tub, bowl): 'The single specimen obtained differs from representatives of its two congeners in having a black metatarsal tubercle (pale in other species)...' (Hosmer, 1962: 2).

nichollsi H.W. Parker, 1940 (Desert Spadefoot Toad) - After the collector of one of the paratypes: 'Rabbit-Proof Fence No. 1, Far North, W.A. Nicholls.' (Parker 1940: 64). (See under *Metacrinia nichollsi*.)

weigeli Shea & Johnston, 1988 (Weigel's Toad) - 'The species is named after Mr John Weigel of Gosford, NSW, co-collector of the Mitchell Plateau paratypes, in honour of his efforts to promote amateur herpetology in Australia.' (Shea & Johnston, 1988: 33). Herpetologist John Weigel is Director of the Australian Reptile Park at Somersby, near Gosford. In 2008 he was appointed a Member of the Order of Australia (AM) for contributions to tourism, herpetology and snake venom production.

Nyctimystes Stejneger, 1916 (m.) - genus *nyktes* (night) + *mystes* (a mystic), a name cleverly constructed to parallel *Nyctimantis*, the genus from which Stejneger separated a New Guinean species. The latter name is from *nyktes* + *mantis* (seer, prophet), an allusion to the erect pupil of the eye: 'The main generic difference relied on to distinguish it from *Hyla* was the erect pupil.' (Stejneger, 1916: 85). [The single Australian species, *N. dayi*, was recently transferred to *Litoria* (Kraus, 2013), but as the previous name might still be used it seems prudent to include this genus.]

Paracrinia Heyer & Liem, 1976 (f.) - 'From the Greek *para* (= beside), indicating the fact that the relationship of this genus falls within the *Crinia* complex. The genus is feminine in gender.' (Heyer & Liem, 1976: 12).

haswelli (Fletcher, 1894) (Haswell's Frog or Froglet) - 'In September last at the invitation of Professor Haswell I had the pleasure of joining a small dredging and collecting party organised by him to visit Jervis Bay. On that occasion two specimens of the new *Crinia* were obtained.' (Fletcher, 1894: 523). Scottish-born William Aitchison Haswell (1854-1925) came to Australia because of poor health after receiving his DSc, and stayed for the rest of his life. He was appointed Challis Professor of Biology at the University of Sydney in 1890, and with T. Jeffrey Parker wrote the monumental *A Text Book of Zoology*, which ran into four editions (Morison, 1983).

Philoria Spencer, 1901 (f.) - No doubt from philos (fond of) + oros (mountain), alluding to the type locality (Mount Baw Baw, Victoria), although Spencer (1901: 177) did not state the etymology.

frosti Spencer, 1901 (Baw Baw Frog) - 'Habitat, Mount Baw Baw, Victoria. Collected by Mr. C. Frost.' (Spencer, 1901: 177). The person referred to by Spencer was presumably English-born Charles Frost (1842-1933), a foundation committee member of the Field Naturalists Club of Victoria, although possibly his son, Charles Hamilton Frost (1868-1950), who was also a biologist and an early member of the club. However, as a reviewer pointed out, Charles Frost senior had a particular interest in herpetology so it seems more likely that he was the collector. The specimens had already been conveniently killed by a tiger snake, which regurgitated them while being kept in a bag after being captured (Spencer, 1901: 175-176).

kundagungan (Ingram & Corben, 1975) (Mountain Frog) - 'The name *kundagungan* is derived from the words 'kunda', mountain, and 'gungan', frog, from the dialect of the Kabi tribe, that once lived in south-east Queensland.' (Ingram & Corben, 1975: 338).

loveridgei H.W. Parker, 1940 (Loveridge's Frog) - 'The specimen is one of the series recorded as *P. frosti* by Loveridge.' (Parker, 1940: 61). Welsh-born Arthur Loveridge (1891-1980) spent a number of years in Africa before moving to become Curator of Amphibians at the Museum of Comparative Zoology, Harvard University in 1924 (Gans, 1981). His catalogues on the specimens of reptiles and amphibians of Australia and New Guinea held by the Museum of Comparative Zoology stimulated new studies on Australian frogs and were major taxonomic references for decades.

pughi Knowles, Mahony, Armstrong & Donnellan 2004 (Pugh's Sphagnum Frog) - 'Named for Dailan Pugh (North East Forest Alliance), for his contributions to the protec-

tion of the habitat of the species.' (Knowles *et al.*, 2004: 70). Dailan Pugh is a well-known artist in north-eastern New South Wales, and has been active in conservation campaigns in the region. His father was the great Australian artist Clifton Pugh.

richmondensis Knowles, Mahony, Armstrong & Donnellan 2004 (Richmond Range Sphagnum Frog) - 'Named after the Richmond Range area that contains the entire distribution of the species.' (Knowles *et al.*, 2004: 70). The Richmond Range is in north-eastern New South Wales, near the Queensland border.

sphagnicolus (Moore, 1958) (Sphagnum Frog) - *sphagnum* (bog moss) + *colus* (loving), an allusion to the habitat: 'Females and males were also taken in a sphagnum bog. The males were calling, and a search for them was made by my pulling apart the sphagnum mat. The males and females were frequently as much as 15 cm. below the surface of the sphagnum.' (Moore, 1958: 4). See under *Litoria rheocolus* for a discussion of the use of *-colus*.

Platyplectrum Günther, 1863 (n.) - *platys* (flat) + *plectron* (plectrum, spear-point, oar), referring to the shape of the metatarsal spur: 'Metatarsus with a flat sharp-edged spur (as in *Sphaerotheca*).' (Günther 1863a: 27). Günther (1863a) based the genus on *P. marmoratum*, a synonym of *P. ornatum*.

ornatum (Gray, 1842) (Ornate Burrowing Frog) - Latin *ornatus* (adorned, decorated), a reference to the pattern of the skin on the back: '...very beautifully and symmetrically marbled with blackish grey on the back...' (Gray, 1842: 56). Gray placed the species in *Discoglossus*, and it has commonly been placed in *Limnodynastes*.

spenceri H.W. Parker, 1940 (Spencer's Burrowing Frog, Spencer's Frog) - 'Holotype...collected at Alice Springs, C. Australia, by Professor W. B. Spencer' (Parker, 1940: 50). Sir Walter Baldwin Spencer (1860-1929) was foundation chair of biology at The University of Melbourne, director of the Museum of Victoria, and zoologist and photographer on the Horn Expedition of 1894 on which the type was collected. He did not use his given first name, being known always as Baldwin Spencer. The two reviewers pointed out that, when examining Spencer's collections that had been lodged in the British Museum, Parker realised that they were an undescribed species, rather than *L. ornatus* to which Spencer had assigned them.

Pseudophryne Fitzinger, 1843 (f.) - *pseude* (false) + *phryne* (toad), an allusion to genus *Phryniscus*, from which *Pseudophryne* was separated (Fitzinger, 1843: 32).

australis (Gray, 1835) (Red-crowned Toadlet) - Latin *australis* (from the south), alluding to the geographic locality, '*Hab.* in Australia.' (Gray, 1835: 57).

bibronii Günther, 1858 (Bibron's Toadlet, Brown Toadlet) - After French zoologist Gabriel Bibron (1805-1848) who, with (A.M.) Constant Duméril first named the species *Phryniscus australis* (Günther, 1858: 46). When Günther transferred the species to *Pseudophryne* the epithet *australis* was pre-occupied in that genus (see above), so he followed the convention in such circumstances of using the surname of the original author to produce a new specific epithet. Bibron worked as Duméril's assistant at the Muséum National d'Histoire Naturelle in Paris, mainly describing fish, reptiles and amphibians. Between 1834 and 1844 they published seven of the nine volumes of the mammoth *l'Erpétologie générale ou Histoire naturelle complète des reptiles* (1834-1854), completed in 1854 by Duméril and his son Auguste, with Bibron still listed as a co-author although he had died six years earlier of tuberculosis, at the age of 42.

coriacea Keferstein, 1868 (Red-backed Toadlet) - Latin *coriaceus* (leathery), a simple reference to the colour: 'Rücken glatt, von bräunlicher Färbung, an den Seiten dunkler.' [Back smooth, of a brownish colour, darker at the sides.] (Keferstein, 1868: 272).

corroboree Moore, 1953 (Southern Corroboree Frog) - 'The specific name was suggested by the resemblance of the dorsal pattern of *P. corroboree* to the body markings used by some Australian aboriginal tribes in their corroborees.' (Moore, 1953: 180).

covacevichae Ingram & Corben, 1994 (Magnificent Brood Frog) - 'For Ms Jeanette Covacevich. The common name 'Magnificent Broodfrog' is recommended for *P. covacevichae*.' (Ingram & Corben, 1994: 269). Jeanette Covacevich was for many years curator of herpetology at the Queensland Musuem. In 1995 she was appointed a Member of the Order of Australia (AM) for her service to herpetology and conservation, in 2005 she was awarded the Public Service Medal, and in 2007 was awarded the Australian Natural History Medallion by the Field Naturalists Club of Victoria.

dendyi Lucas, 1892 (Dendy's Toadlet, Southern Toadlet) - 'A single male specimen, found by Dr. Dendy on our visit to Wellington River, North Gippsland.' (Lucas 1892: 63). English-born Arthur Dendy (1865-1925), a world-renowned authority on sponges, spent six years at the University of Melbourne from 1888 to 1893. In that time he was a member of the Royal Society of Victoria and the Field Naturalists Club of Victoria (Smith, 1981).

douglasi Main, 1964 (Douglas's Toadlet) - After A.M. Douglas, who collected the original series of specimens of the species at Cape Range in June 1955 (Main, 1964: 66). Athol Mardon Douglas (b. 1915) was an experimental officer with the Western Australian Museum in Perth, where he worked mainly as a collector. Most of his collections were made in the 1950s and 1960s. He wrote numerous papers for the *Western Australian Naturalist* on a variety of subjects, and a book on the decline of native fauna (Douglas, 1980).

guentheri Boulenger, 1882 (Günther's Toadlet) - After Albert Günther (1830-1914), German-born British zoologist who began work cataloguing zoological collections at the British Museum in 1857, becoming keeper of zoology in 1875 after the retirement of J.E. Gray (Cleevely, 2004). His vast contribution to Australian herpetology is clear from the numerous references in this paper.

major H.W. Parker, 1940 (Large Toadlet) - Latin *major* (large). 'This species is...distinguished by its much larger size...' (Parker 1940: 99).

occidentalis H.W. Parker, 1940 (Orange-crowned Toadlet, Western Toadlet) - Latin *occidentalis* (from the west), a simple reference to the geographic range. 'This is the West Australian species identified by Loveridge with *P. australis* Gray.' (Parker, 1940: 98).

pengilleyi Wells & Wellington, 1985 (Northern Corroboree Frog) - After zoologist Ross Pengilley, who first noted differences in the Fiery and Brindabella Ranges populations of *P. corroboree* when compared with the Snowy Mountains populations: 'Populations ... can be grouped into two forms on the basis of the amount of yellow dorsally and ventrally, and the colour pattern' (Pengilley, 1971: 75). Wells and Wellington (1985: 3) separated the species from *P. corroboree* on the basis of Pengilley's work.

raveni Ingram & Corben, 1994 (Copper-backed Brood Frog, Raven's Brood Frog) - 'For Dr Robert Raven. The common name 'Copper-backed Broodfrog' is recommended for *P. raveni*.' (Ingram & Corben, 1994: 271). Robert Raven is an internationally renowned arachnologist. He is currently Head of Terrestrial Biodiversity and Senior Curator of Chelicerata at the Queensland Museum, Brisbane (Queensland Museum, 2013). Although working primarily on spiders, he has also worked on earthworms, snails and frogs.

robinsoni Donnellan, Mahoney & Bertozzi, 2012 - 'Named for Dr Tony Robinson, formerly of the South Australian Department for the Environment and Natural Resources who was chiefly responsible for the initiation and sustained management of a

state wide biodiversity survey conducted over 25 years...' (Donnnellan *et al.*, 2012a: 83).

semimarmorata Lucas, 1892 (Southern Toadlet) - Latin *semi* (half) + *marmoratus* (marbled), from the partial marbling on the body: 'Belly light olive-green, marbled finely with white' (Lucas, 1892: 63).

Rheobatrachus Liem, 1973 (m.) - Greek *rheos* (stream) + *batrachos* (frog), alluding simply to the habitat of the type species, *R. silus*: 'This species is found along rocky mountain streams in wet sclerophyll forest...' (Liem, 1973: 468).

silus Liem, 1973 (Gastric-brooding Frog) - 'The specific name is derived from Latin '*silus*', meaning '*pug nose*', which refers to the blunt snout.' (Liem, 1973: 469).

vitellinus Mahony, Tyler & Davies, 1984 (Northern Gastric Brooding Frog, Stream Frog) - 'The specific name is derived from the Latin *vitellinus* "of the yolk of an egg" and refers to the ventral colouration.' (Mahony *et al.*, 1984: 161). The entire surfaces of the legs, groin, and most of the arms are a rich yellow that the specific epithet describes perfectly.

Rhinella Fitzinger, 1826 (f.) - *rhinos* (nose) + Latin diminutive ending *-ella*, referring to the elongation of the snout into a small beak, a character lacking in other Bufonoidea: 'Aus Spix's Oxyrhynchus proboscideus bildete ich meine Gattung Rhinella. Die übrigen Arten, welche Spix unter seine Gattung Oxyrhynchus begreift, sind wahre Bufonen mit höchst unbedeutend langerem Rüssel.' [I based my genus *Rhinella* on Spix's *Oxyrhynxhus proboscoideus*. The other species, which Spix included under his genus *Oxyrhynchus*, are true *Bufo* with a very insignificantly elongated snout.] (Fitzinger, 1826: 39).

marina (Linnaeus, 1758) (Cane Toad) - Latin *marina* (marine), from the mistaken belief that the species could live in the ocean: 'Rana marina maxima' (Linnaeus, 1758: 211). The error originated with Seba (1734: 120): 'Num. I. *Rana, Marina, Americana, rara; mas.*' and 'Videtur species haec & terra marique victum quaerere'. Lewis (1891), in a rare error, translated the Latin name *rana marina* as 'the frog-fish'.

Spicospina Roberts, Horwitz, Wardell-Johnson, Maxson & Mahony, 1997 (m.) - 'The generic name refers to the spines on the posterior margins and the transverse process of the vertebra: *spico* - a spine; *spina* - spine or vertebra.' (Roberts *et al.*, 1997: 376). The stated etymology (from Latin) is not quite accurate, since the very rare first conjugation *spico* means 'to furnish with spikes' in the sense of ears of wheat or corn.

flammocaerulea Roberts, Horwitz, Wardell-Johnson, Maxson & Mahony, 1997 (Sunset Frog) - 'The specific name refers to the distinctive ventral colouration: *flammo* for orange and *caerulea* for the light blue spots.' (Roberts *et al.*, 1997: 376).

Taudactylus Straughan & Lee, 1966 (m.) - *tau* (Greek letter T) + *daktylos* (finger, toe): '*Taudactylus* is distinguished from all other genera of Australian frogs by the unique character of T-shaped terminal phalanges to which the name alludes.' (Straughan & Lee, 1966: 62). It is important to note that other microhylids have T-shaped terminal appendages (Tyler *in litt.*), so the name applies not to the presence of such phalanges but to their 'unique character'.

acutirostris (Andersson, 1916) (Sharp-nosed or Sharp-snouted Torrent Frog) - Latin *acutus* (sharp) + *rostrum* (snout), from the shape of the rostrum: '...canthus rostralis sharp, loreal region straight, not concave' and 'This new species is very well distinguished from other species of the genus *Crinia* by its long and prominent nose...' (Andersson, 1916: 8, 10).

diurnus Straughan & Lee, 1966 (Mount Glorious Torrent Frog) - Latin *diurnus* (by day), referring to the period of activity: 'The species is diurnal and was not collected at night.' (Straughan & Lee, 1966: 64).

eungellensis Liem & Hosmer, 1973 (Eungella Torrent Frog) - 'The specific name

refers to the locality, Eungella, where the holotype was collected. The name Eungella is of aboriginal origin meaning 'Land of the cloud'.' (Liem & Hosmer 1973: 448). 'Eungella' is pronounced 'Yungulla', with the stress on the first syllable.

liemi Ingram, 1980 (Liem's Frog) - 'The new species is here described as *T. liemi*, in recognition of the contribution to herpetology made by Dr David Liem.' (Ingram, 1980: 111). David Liem is a well-known herpetologist, perhaps best known as the discoverer of the Gastric-brooding Frog (see *Rheobactrachus silus*).

pleione Czechura, 1986 (Pleione's Torrent Frog) - 'Named for Pleione, mother of the Pleiades in Greek mythology. The star Pleione is thought to be the 'missing' bright star of the Pleiades cluster...' (Czechura, 1986: 301). The allusion is to the fact that, like the star Pleione (which is often invisible to the naked eye because its magnitude varies considerably), the frogs may be almost undetectable during periods of low activity, when they shelter deep in rock crevices (Czechura, loc. cit.). The subtlety of the name is enhanced by the fact that the Pleiades are in the constellation Taurus, and Pleione is known by the abbreviated astronomical name 28 Tau.

rheophilus Liem & Hosmer, 1973 (Tinkling Frog) - 'The specific name is derived from the Greek prefix *rheos*, meaning stream, and the Greek word *philos* meaning love or fond of, with reference to the creek-dwelling habit.' (Liem & Hosmer, 1973: 454).

Uperoleia Gray, 1841 (f.) - *hyperoa* (palate) + *leios* (smooth), referring to the smooth (i.e. toothless) palate: 'Head large; palate toothless...This genus is most nearly allied to *Leiuperus* of MM. Duméril and Bibron, with which it agrees in having no teeth on the palate, but it differs from it in the tympanum being quite hid.' (Gray 1841a: 90). The genus *Leiuperus* has an identical etymology, with the stems reversed: 'De λειος, lisse, uni, et de υπερωα, palais. - Palais lisse ou sans dents.' [From *leios*, smooth, even, and from *hyperoa*, palate. -Palate smooth or without teeth.] (Duméril & Bibron, 1841: 420). Gray (1841b: 436) republished the name as *Uperoleja*, an invalid emendation since it is an orthographic variant of his original name. Cope (1865: 108) attempted to alter the name to *Hyperolia*, apparently believing that Gray's name was linguistically inelegant, but Cope's name is, in any case, a junior homonym of *Hyperolius* Rapp, 1842 (Amphibia).

altissima Davies, Watson, McDonald, Trenerry & Werren, 1993 (Alpine Toadlet, Montane Toadlet) - Latin *altissima*, superlative of *altus* (high): 'The specific name is derived from the Latin *altus* meaning high, in reference to the elevation at which the species has been collected.' (Davies *et al.*, 1993: 172). The holotype and paratypes were collected from the Atherton Tableland and Windsor Tableland at altitudes above 800 metres.

arenicola Tyler, Davies & Martin, 1981 (Jabiru Toadlet) - 'The specific name is derived from the Latin *arena* (sand) and *cola* (inhabitant or dweller).' (Tyler *et al.*, 1981a: 30).

aspera Tyler, Davies & Martin, 1981 (Derby Toadlet) - 'Derived from Latin *aspera* (rough in relation to texture) describing the texture of the skin of the dorsum.' (Tyler *et al.*, 1981c: 166).

borealis Tyler, Davies & Martin, 1981 (Northern Toadlet) - 'From the Latin word *borealis* (northern).' (Tyler *et al.*, 1981a: 34).

capitulata Davies, McDonald & Corben, 1986 (Small-headed Toadlet) - 'From the Latin *capitulus* meaning having or ending in a small head, alluding to the characteristic feature of this species.' (Davies *et al.*, 1986a: 163).

crassa Tyler, Davies & Martin, 1981 (Fat Toadlet) - 'From the Latin *crassus*, meaning black, fat or stout and alluding to the gross form of this species.' (Tyler *et al.*, 1981a: 39).

daviesae Young, Tyler & Kent, 2005 - 'The specific epithet daviesae honors Margaret Davies, whose published contributions

have substantially expanded knowledge of the genus *Uperoleia*.' (Young *et al.*, 2005: 608).

fusca Davies, McDonald & Corben, 1986 (Dusky Toadlet) - 'From the Latin *fuscus* meaning dusky with reference to the ventral pigmentation of the species.' (Davies *et al.*, 1986a: 174). The authors noted that the entire ventral surface was 'pigmented with chocolate coloured patches of granules' (Davies *et al.*, 1986a: 168).

glandulosa Davies, Mahony & Roberts, 1985 (Glandular Toadlet) - 'The specific epithet is from the Latin *glandula* in reference to the prominent parotoid, inguinal and coccygeal glands in this species.' (Davies *et al.*, 1985: 107).

inundata Tyler, Davies & Martin, 1981 (Floodplain Toadlet) - 'From the Latin *inundatio*, meaning inundation or flood, and referring to the floodplains that dominate the area where this species was found.' (Tyler *et al.*, 1981a: 43).

laevigata Keferstein, 1867 (Smooth Toadlet) - Latin *laevigata* (smooth), referring to the back: 'Rücken glatt, oder nur mit kleinen Höckern.' [Back smooth or with only small tubercles.] (Keferstein, 1867: 349). Keferstein first described the frog as a variety of *Uperoleia marmorata*.

lithomoda Tyler, Davies & Martin, 1981 (Stonemason Toadlet) - 'From the Greek word *lithomodos*, 'a mason', referring to the call of the species which resembles the chipping of stone.' (Tyler *et al.*, 1981a: 46).

littlejohni Davies, McDonald & Corben, 1986 (Littlejohn's Toadlet) - 'The species is named for Murray Littlejohn of the University of Melbourne in recognition of his contributions to the study of herpetology in Australia and of *Uperoleia* in particular.' (Davies *et al.*, 1986a: 178). (See *Litoria littlejohni*.)

marmorata Gray, 1841 (Marbled Toadlet) - Latin *marmoratus* (marbled), referring to the patterning on the skin: 'Black and green marbled...' (Gray, 1841b: 90).

martini Davies & Littlejohn, 1986 (Martin's Toadlet) - 'This species is named for Angus A. Martin in recognition of his contribution to the studies of *Uperoleia*.' (Davies & Littlejohn, 1986: 130). Associate Professor Angus Martin worked at The University of Melbourne, where he is currently a Principal Research Fellow, and later at the Melbourne Zoo. In 2010 he was elected an Honorary Life Member of the Australian Society of Herpetologists.

micra Doughty & Roberts, 2008 - *mikros* (small): 'The new species is characterized by a combination of small body size...' (Doughty & Roberts, 2008: 10).

micromeles Tyler, Davies & Martin, 1981 (Tanami Toadlet) - 'Derived from two Greek words: *mikros* (small), and *melos* (limb), alluding to the short limbs of this species.' (Tyler *et al.*, 1981a: 49).

mimula Davies, McDonald & Corben, 1986 (Mimic Toadlet) - 'From the Latin *mimula* meaning an actor or mimic with reference to the similarity in morphology and call of this species to its sympatric congener *U. lithomoda*.' (Davies *et al.*, 1986a: 183).

minima Tyler, Davies & Martin, 1981 (Small Toadlet) - Latin *minimus* (very small): 'A very small species (males 16-21 mm)...' (Tyler *et al.*, 1981a: 49).

mjobergii (Andersson, 1913) (Mjoberg's Toadlet) - After Swedish zoologist Erik Georg Mjöberg (1882-1938), who collected the original specimens: '2 specimens, male and female, Noonkambah, Kimberley Division, N.W. Australia, 160 miles from the coast in temporary pools. Dec. 1910. E. Mjöberg.' (Andersson, 1913: 19). Mjöberg was awarded a PhD in entomology from Lund University in 1910, and immediately after undertook his two 'Swedish Scientific Expeditions to Australia' (north-western Australia in 1910-1911, and Queensland in 1912-1913). The amphibians were sent to the Museum of Natural History in Stockholm, and the keeper of vertebrates, Einar Lönnberg, sent them to Lars Andersson to identify. In 1920 Mjöberg was appointed Swedish consul in Sumatra, and led a scientific

expedition to central Borneo in 1925-1926 (Ferrier, 2006). After returning to Sweden in 1926 he published his experiences in three popular books, *Among Wild Animals and Men in Australia*, *Forest Life and Adventures in the Malay Archipelago*, and *Borneo: Land of the Head Hunters*.

orientalis (H.W. Parker, 1940) (Alexandria Toadlet) - Latin *orientalis* (from the east), a simple reference to the geographic range. 'These eastern specimens appear to differ constantly from the western *G. russelli*...' (Parker, 1940: 67).

rugosa (Andersson, 1916) (Wrinkled Toadlet) - Latin *rugosus* (wrinkled), referring to the enlarged parotoid and inguinal glands: 'Three large porous and rugose glands on the sides of the body...' (Andersson, 1916: 14). Andersson was in fact uncertain whether his new species was genuinely separate from *Uperoleia mjobergii*, which he had described three years earlier (as a species of *Pseudophryne*).

russelli (Loveridge, 1933) (Russell's Toadlet) - 'At Mr. Glauert's request, the type is named after Captain R. E. Russell of Landor Station who was his host at the time these frogs were collected.' (Loveridge, 1933b: 89). Landor Station is in the Gascoyne region of Western Australia, about 130 km east of Meekatharra. [Alfred] Robert Eric Russell (1892-1971) was manager of Landor in the 1930s, before moving to Perth to work in the food industry. He was an officer with the 3rd Australian Pioneer Battalion in WW1, receiving the Military Cross for 'conspicuous gallantry and devotion to duty' in an action in France on 6 September 1918. He also served in the Australian Army in WW2 (CHS, 2012).

stridera Catullo, Doughty & Keogh, 2014 (Ratcheting Frog) - 'The name is a euphonious random combination of letters suggestive of the Latin *strido*, meaning a creaking or grating sound. This refers to the grating nature of the call.' (Catullo *et al.*, 2014: 260). Latin *strido* is in fact a verb; *stridor* is the noun. Under Article 31.2.3 of the Code (ICZN, 1999) the epithet should be treated as indeclinable and therefore unchangeable.

saxatilis Catullo, Doughty, Roberts & Keogh, 2011 - 'The Latin word *saxatilis* is an adjective meaning 'associated with rocks' referring to the distribution of this species on the rocky Pilbara craton.' (Catullo *et al.*, 2011: 25).

talpa Tyler, Davies & Martin, 1981 (Mole Toadlet) - 'The Latin word *talpa* (mole) has been chosen because this species exhibits exceptionally large metatarsal tubercles, and evidently is an efficient burrower.' (Tyler *et al.*, 1981a: 54).

trachyderma Tyler, Davies & Martin, 1981 (Blacksoil Toadlet) - *trachys* (rough, harsh) + *derma* (skin): 'From the Greek *trachys*, 'rough', and *derma* 'skin', in reference to the unusual skin condition.' (Tyler *et al.*, 1981b: 149). The species 'is characterised by a finely tubercular dorsum...the texture of which has not been reported in any other Australian amphibian' (Davies *et al.*, 1986a: 160).

tyleri Davies & Littlejohn, 1986 (Tyler's Toadlet) - 'This species is named for Michael J. Tyler in recognition of his contribution to studies of the genus *Uperoleia*.' (Davies & Littlejohn, 1986: 134). (See under *Litoria tyleri*).

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FOOD ITEMS OF THE GOLDEN CROWNED SNAKE *CACOPHIS SQUAMULOSUS*

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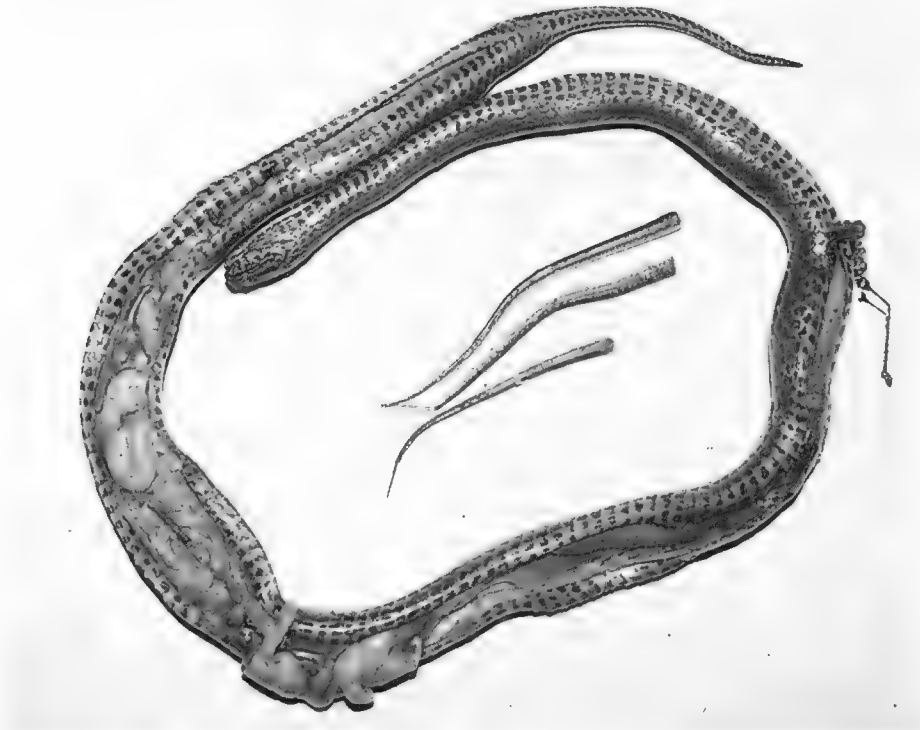
The Golden Crowned Snake *Cacophis squamulosus* is a small elapid within a genus that consists of four species (Wilson & Swan, 2010). All species are distributed along the east coast of Australia from the tropics (*C. churchilli*) to temperate climes (*C. squamulosus*). *Cacophis squamulosus* has a distribution that ranges from South Brooman State Forest in New South Wales (NSW) north to Proserpine in Queensland (Atlas of Living Australia searched 17 July 2013). All species are nocturnal and feed mostly on small skinks and lizard eggs (Shine, 1980).

On 30 September 2012 I located a road-killed female *C. squamulosus* in Kangaroo Valley NSW. The animal measured 574 mm in total length (tail 73 mm) and weighed 81.2 g. The animal was dissected and was found to have in its stomach the tails of three skinks. Examination of the shape (laterally flattened) and colour pattern on these tails indicated that they were from the Eastern Water Skink *Eulamprus quoyii* (Figure 1).

Figure 1. Dissected female *Cacophis squamulosus* showing *Eulamprus quoyii* tails removed from its stomach.



Cacophis squamulosus has been frequently observed active on warm nights in spring and summer in the broader region of Kangaroo Valley yet is rarely detected during diurnal reptile searches (Murphy & Daly, 1998; Daly, 2006; Daly & Lemckert, 2012). Since *C. squamulosus* is nocturnal it must locate and capture its food at night (Shine, 1980). Snakes usually eat their prey head-first (Shine, 1991) but the current observation suggests that if the snake finds a sleeping large lizard such as *E. quoyii* it may only eat the tail. There may be several explanations for this observation. Either this was a deliberate strategy for the snake i.e. the lizards were detected by the snake at night, assessed to be too large to eat whole and so a portion of the tail was deliberately selected as the meal. Or was this a case of the snake finding sleeping skinks, trying to subdue them and the skinks escaped after dropping the tails, which were then consumed by the snake?

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BOOK REVIEW

THE EPONYM DICTIONARY OF AMPHIBIANS

By Bo Beolens, Michael Watkins and Michael Grayson, 2013
xv + 244pp., no index, hardcover.
Published by Pelagic Publishing, Exeter, UK.
RRP UK£34.99 (about AUD$80) plus £8.99 postage to Australia / New Zealand.
ISBN: 978-1907807411.

eponym 1. One for whom or which something is or is believed to be named. 2. A name (as of a drug or disease) based on or derived from an eponym. — Merriam-Webster Dictionary

"The Eponym Dictionary of Amphibians" is the third publication in a series of such dictionaries, following those covering mammals and reptiles and followed by two more recent volumes covering birds and sharks. These books are in fact dictionaries in reverse: the reader looks up the origin (personal name) of a word (genus or specific epithet), rather than the word and then the origin or meaning.

So this book is really about the people behind the names, rather than the names themselves, and with this in mind it is a delight. It can be read from cover to cover or browsed for interesting tit-bits of information. And speaking of cover, the cover art by Madeline von Foerster depicts a 'cabinet of curiosities' containing a variety of amphibians, and as a work of art is superb. According to the authors, 'The closed drawers in the painting represent all the frog species not yet discovered, and those who might die out before becoming known to us.' But not all the species depicted appear in the dictionary, and unfortunately there is no salamander.

Entries are based on both scientific and English names, so that people who would not appear if only scientific names were used, such as Tschudi, are included. In total there are 2668 amphibians honouring 1609 individuals, 128 that seem to be eponyms but are not, and another 83 that relate to places, indigenous people, fictional and mythological characters, and various other groups, including in one case (*amicorum*) a group of unnamed friends. Some gems are Farc (FARC, a guerilla organisation: *Atelopus farci*), Alberich (a character in the Nibelungenlied: *Albericus*, under which eight species have been named for other Nibelungenlied characters), Shiv (cricketer Shivnarine Chanderpaul: *Rhinatrema shiv* — the name was coined by David Gower!), Sting (the singer: *Dendropsophorus stingi*), Spartacus (the gladiator: *Litoria spartacus*), Zorro (the masked hero: *Pseudophilautus zorro*), and Hoipollo, from Hoipollo's Bubble-nest Frog *Pseudophilautus hoipolloi*, which the authors point out takes its name from *hoi polloi* (from Greek 'the many'), not some mysterious Dr Hoipollo.

The detailed research undertaken by the authors is obvious from the range and completeness of names and the depth of information they have gleaned about the people. Each entry consists of a list of the relevant species or genera and a short biography of the eponymous individual or group. For Australian herpetologists there are many familiar names: Cogger, Copland, Darlington, Duméril, Ewing, Freycinet, Fry, Hosmer, Liem, Littlejohn, Loveridge, Main, Moore, Nicholls, Péron, Spencer, Steindachner, Tyler, Zweifel, and numerous others. In fact, all the extant eponymous names of Australian species based on individuals are included in the book, which on its own is an impressive fact. Add to this that the book covers all parts of the world, and it is a remarkable achievement.

There are occasional annoyances, however. Luiz Otavio Gonçalves is honoured by the

name *Scinax luizotavioi*, but his name appears only under Luiz Otavio, and similarly Karen Anne Pyburn (*karenanneae*) and David Gower (*davidi*). On the other hand, Chris Dahl is honoured by *Litoria chrisdahli* and Blair Hedges by *blairhedgesi*, but they appear only under their surnames. There is consistency but no logic in this rigid approach. If you were asked whether a species was named after Gonçalves, Gower or Pyburn, you would probably answer 'no' if you looked up this dictionary. More complete cross-referencing, as is done under 'Darwin & Wallace' for *Epipedobates darwinwallacei*, and 'Mozart' for *Eleutherodactylus amadeus*, would make the book far more useful. (The name *darwinwallacei* itself is problematic, since it is not listed under either Darwin or Wallace, so that someone using the book to find the species named for Wallace would miss that one, although they might spot it for Darwin.

It is understandable that some names have snuck under the authors' radar. For example, US herpetologist Stephen Karsen (*Karsenia*, 2005) and the Australian Indigenous peoples the Nyakali (*Litoria nyakalensis*, 1974) and Olungbura (*L. olunguburensis*, 1977), the last two perhaps because of the termination *-ensis*, which suggests a place rather than people. Another occasional hiccup is the inclusion of only one person where the epithet clearly indicates more than one (e.g. the termination *-orum*, as in *rabborum* which honours both George and Mary Rabb, not merely George). And sometimes a species names is overlooked, as is *Litoria paraewingi* under Ewing. But by far the most glaring and puzzling omission is Hylas, the eponymous origin of the old and well-known name *Hyla* and thus *Hylarana*.

An unfortunate consequence of taxonomy is that many eponymous names have fallen into disuse through synonymy, and the people that they honoured thus may be forgotten. Some Australian examples from herpetology are *Crinia michaelseni, Hyla fordii, Hyla kinghorni, Hyla schuettii, Hyla spaldingi, Hyla spengeli, Hyla spengleri, Opisthodon frauenfeldi, Pseudophryne blanchardi, Wagleria*, and a plethora of names coined by Wells and Wellington. To include those forgotten names would require another book again, but perhaps one day someone will have the time and patience to write it.

The bibliography is abbreviated by including only the title of various journals referenced, rather than individual articles, which is understandable but rather a pity as it is impossible for the reader to find a particular reference other than searching internet resources, which might not lead to the source in any case. Two puzzling omissions are the "American Dictionary of National Biography" and the "Australian Dictionary of Biography", which are rich sources of information on some of the people listed in this dictionary.

The price of the book may be prohibitive for individuals, and it is surprising that a PDF version is not available for purchase, since this would undoubtedly make it more popular and also enable the content to be updated easily as new taxa are named.

One must now look forward now to a volume on wasps, in whose pages we will be able to read biographies of such behemoths of zoology as Ellen DeGeneres, Shakira, Lady Gaga, J.S. Bach, Beethoven, Pink Floyd, David Letterman, John Lennon, Greta Garbo, Frank Sinatra, Ian Fleming, Goethe, Tolkien, Marx, Dante, Emerson, Thoreau, and the prophet Elijah.

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NOTES TO CONTRIBUTORS

Herpetofauna publishes articles on any aspect of reptiles and amphibians. Articles are invited from interested authors particularly non-professional herpetologists and keepers. Priority is given to articles reporting field work, observations in the field and captive husbandry and breeding.

All material must be original and must not have been published elsewhere.

PUBLICATION POLICY

Authors are responsible for the accuracy of the information presented in any submitted article. Current taxonomic combinations should be used unless the article is itself of a taxonomic nature proposing new combinations or describing new species.

Original illustrations will be returned to the author, if requested, after publication.

SUBMISSION OF MANUSCRIPT

Two copies of the article (including any illustrations) should be submitted. Typewrite or handwrite (neatly) your manuscript in double spacing with a 25mm free margin all round on A4 size paper. Number the pages. Number the illustrations as Figure 1 etc., Table 1 etc., or Map 1 etc., and include a caption with each one. Either underline or italicise scientific names. Use each scientific name in full the first time, (eg *Delma australis*), subsequently it can be shortened (*D. australis*). Include a common name for each species.

The metric system should be used for measurements.

Place the authors name and address under the title.

Latitude and longitude of any localities mentioned should be indicated.

Use the Concise Oxford Dictionary for spelling checks.

Photographs – High resolution digital, black and white prints or colour slides are acceptable.

Use a recent issue of Herpetofauna as a style guide.

Manuscripts may be submitted to the editor electronically, via email (gshea@mail.usyd.edu.au) or on CD. Manuscripts submitted electronically must be in Word format, with photographs as separate jpg or tif files.

Articles should not exceed 12 typed double spaced pages in length, including any illustrations.

REFERENCES

Any references made to other published material must be cited in the text, giving the author, year of publication and the page numbers if necessary. At the end of the article a full reference list should be given in alphabetical order. (See this journal).

Manuscripts will be reviewed by up to three referees and acceptance will be decided by an editorial committee. Minor changes suggested by the referees will be incorporated into the article and proofs sent to the senior author for approval.

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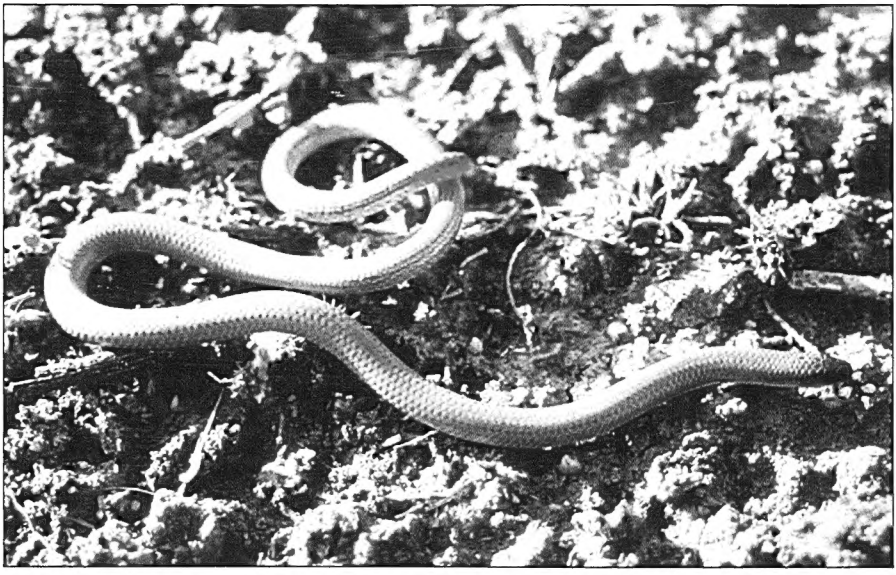

Pink-tailed Worm Lizard, *Aprasia parapulchella*, from 45 km NNE of Hay, New South Wales. See article on this range extension on page 14.

Eastern Froglet (*Crinia signifera*) from Kosciusko National Park, New South Wales (photo: G. Shea). See article on the etymology of Australian frog names on page 18 for a new explanation of the meaning of *signifera*.